

4.

MATERIALS

Knowing What To Know



Beads, Clasps, Stringing Materials, Wire

Abstract:

Materials establish the character and personality of jewelry. They contribute to understandings whether the piece is finished and successful. However, there are no perfect materials for every project. Selecting materials is about making smart, strategic choices. This means relating your materials choices to your design and marketing goals. It also frequently means having to make tradeoffs and judgment calls between aesthetics and functionality. There are three types of materials – Stringing, Aesthetic, and Functional. Each material has three types of properties – Material, Physical and Chemical. Materials differ in quality and value. They differ in the associational and emotional connections which they evoke. They differ in their functional efficiency and effectiveness to lend pieces an ability to retain a shape, while at the same time, an ability to move, drape and flow. They differ in cost and durability. Last, materials may have different relationships with the designer, wearer or viewer depending on how they are intended to be used, and the situational or cultural contexts.

MATERIALS: *Knowing What To Know*

The materials I use are alive

The world of jewelry design and the materials used can be complex, especially for jewelry designers just starting out in their careers. The novice, but also the more experienced designer, as well, often run up against some terms and properties of materials they have not dealt with before. Materials affect the appeal of the piece. They affect its structural integrity. They affect the cost. They affect how people view, sense, desire and understand the piece.

You Would Be Very Aware Of...

If you want to gain an understanding of materials, you would be very aware of where they come from, how they are described, sold and marketed. You would be very aware of the beads and jewelry findings and stringing materials and tools, their qualities, when they are useful and when they are not, and what happens to them when they age. You would be very aware of what country the material is made or found in, how the material is manufactured, synthesized or gotten at, if it is modified or changed in any way, and how it comes to market. You would be very aware if the product is sold at different levels of quality, even if this is not differentiated on the product's label. It is also important to be very aware how any of these aspects of the material have changed over time, or might change over time in the future.

You would be very aware that there is no such thing as the *perfect* material. There are only better materials, given your situation and goals. There is no perfect bead for every situation. No perfect clasp. No perfect stringing material. Every choice you make as a jewelry designer will require some tradeoffs and judgment calls. The more you understand the quality of the materials in the pieces you are working with are made of, and the clearer you are about your design goals, and if you are selling things, your marketing goals, as well, the more prepared you will be to make these kinds of choices.

You would be very aware that materials have different values and life spans, and this must relate to your project goals. You would not want to use metalized plastic beads, for example, in a piece you call an *heirloom* bracelet. Metalized

plastic beads are a metal shell around a milky white plastic bead. The shell will chip easily. On the other hand, when doing *fashion jewelry*, these very inexpensive beads, and which have a short life-span, would be perfect. Not only are they cheap, but because they are cheap, there are lots and lots of designs and shapes and textures.

If your goal is to create more investment quality pieces, then you would not want to buy lampwork beads which have not been appropriately annealed (that is, if not cooled down correctly, they will fracture and break easily). You would buy appropriately annealed ones, but which are considerably more expensive. This may affect the look of your pieces. For an inexpensive, fashion oriented piece, your necklace made up entirely of lampwork beads which have not been appropriately annealed might be very affordable. It would have that great handmade, artisan look. It might sell for only \$60.00. With more investment quality lampwork beads, however, you might just use one, or perhaps three lampwork beads, and have a lot of cord showing, or a lot of filler beads, to keep the piece affordable. This would be a very different design look and style. If the necklace was made up of all quality lampwork beads, -- to have the same look and style as its inexpensive cousin -- it might have to retail for \$600-800.00.

Again, for an investment quality piece, you would want to use crystal beads manufactured in Austria or the Czech Republic, and not ones manufactured elsewhere. And you would not let yourself be fooled when the front of the package says "Austrian Crystal" when the back says "Made In China". Crystal beads made in China are not as bright, there are more production issues and flaws in the beads, and the holes are often drilled off-center when compared to their "Made In Austria" counterparts. But crystal beads more appropriate for that investment quality piece might be overkill for a fashion piece where you want to add a pop of brightness without a lot of additional cost.

You would want to be very aware of the treatments of beads and metals. Some things are radiated, heated, reconstituted, partly synthesized, lacquered or dyed. Sometimes this is a good thing and these treatments enhance the quality of materials in appearance and durability. Othertimes this is a bad thing, negatively affecting the quality of materials.

You would be very aware that many of the materials you use are described in ways that do not provide you with sufficient information to make a choice. Take the material *gold-filled*. The definition of *gold-filled* is that the material is a *measurable layer of real gold fused to brass, sometimes copper*. But the legal definition does not tell you how thick the gold has to be over the brass for the material to be called gold-filled. So in the market, some gold-filled has very little gold and will lose its gold very quickly, and other gold-filled has a thicker layer and will keep its gold, its shine, its shape for decades.

Or sterling silver. Sterling silver is supposed to be 92.5% silver (marked .925). The alloy, that is the remaining 7.5%, is supposed to contain, by law, a lot of copper. However, many manufacturers substitute some nickel for the copper to keep the cost down. This makes the sterling silver less expensive, yes, but it also makes it more brittle. It is the difference between being able to open and close the loop on an ear wire, off of which to hang the dangle, many, many times or only two or three times before the wire loop breaks.

Lots of sterling silver items get marked .925. And in jewelry making, many of the pieces we use are so small, there is no .925 stamp on them. Besides a change of what is in the alloy affecting the usefulness and value, many other things happen in the marketplace, as well. Many sterling silver items have been cast. What frequently happens is that some of the silver is lost in the casting process, so it is no longer at 92.5%. Manufacturers are supposed to make note of this, but many just stamp .925 on these items. Some shops label items as sterling silver, but in reality, are selling you pieces that are nickel. And some places will sell you something silver plated, and put sterling silver .925 tag which is marked .925 on it off the clasp. The tag is sterling; the jewelry is not. I've seen some major craft stores and some major jewelry stores sell metalized plastic jewelry and jewelry components and label it .925.

Flexible, nylon coated cable wires are one of the primary types of stringing materials. The measure of cable wire strength is called *tensile strength*. This has to do with what the wires are made of, what the nylon sheathing is made of, and how thick that nylon sheathing is. What makes the wire strong is the nylon sheathing's ability to maintain the twist in the wire. As soon as the integrity of the nylon sheathing is violated, the wire untwists and immediately breaks. You

will not see tensile strength referenced on the labels of these products. The information that is referenced (number of strands, wire thickness) gives you some information needed to make a choice, but insufficient to make an actual choice. Even when they list the number of strands, this doesn't give you enough factual information to depend on. One brand's high-end, 7-strand is stronger and more supple than that same brand's 49-strand middle range product. This same brand's middle range 49-strand product is stronger and more supple than another brand's high end 49-strand product.

You would also be very aware that you cannot assume that there is consistency and uniformity for any given product. There are many production issues that arise in the manufacture of glass beads, for example. Some beads are perfect. Some have flaws. These flaws might include some flat surfaces when everything should be rounded. The color not going all the way through. Holes drilled off-centered. Bead sizes and hole sizes inconsistent from bead to bead. Some bead holes that are especially sharp. Some beads which have coated coloration which is poorly applied and chips off quickly. In clothing, these beads with flaws would be labeled *irregulars*, but they are not so labeled in beads. Some companies specialize in selling you perfect manufactured glass beads; other companies specialize in selling you the irregulars. They don't advertise that fact. Either quality looks the same when you buy it; they just don't hold up the same in close examination or from wear.

You would be aware that fabricated and stamped metal pieces are more durable than cast metal pieces, but a lot more expensive, and with a smaller palette of designs for the artist. You would be aware that the measure of *pound strength* on any label is the weakest piece of information to grab onto. The law only defines how pound strength should be measured. Since most products are manufactured abroad, little care is taken to guarantee the validity of this information.

You would be aware that there are a lot of things to know about the materials used in jewelry design.

It Is All About Choices

Materials play a significant role in jewelry design. You need to relate and justify the choices you make about selecting and using materials to your design goals (and your marketing goals, as well). Sometimes your choices are preformulated and planned; othertimes, these choices are spontaneous and emerge within your process of design. But these are all choices to be made, with inevitable impacts and consequences.

It is through the characteristics and qualities of the materials that the designer comes to keenly and fully appreciate values, intents, desires, and understandings associated with any design.

It is also through the most effective presentation specific to the materials that the designer experiences the piece to its best advantage and potential. The effectiveness results from the designer's ability to maximize the strengths of each material, while minimizing its weaknesses. This is called *leveraging*.

It is a useful exercise, as well, to attempt to simplify the materials and reflect upon whether the piece feels more satisfying and successful, or less so. One key goal of any designer is to reach a point of parsimony where enough is enough.

Appreciation of materials, their selection, use and arrangement lead the designer to see, feel, think and listen to the visual poetry laid out before them. Jewelry is more than functional adornment. It resonates. Materials contribute to this. This appreciation allows the artist to share inspiration and intent with other audiences, the wearer and viewer included. The materials influence the artist in discovery, expression, invention, re-invention, and originality. They become part of the human experience in jewelry design.

For example, you might be in a situation having decide whether to purchase an \$80.00 strand of 6mm round garnet beads, or a \$28.00 strand of these same beads.

In that \$80.00 strand, all the beads actually measure 6mm. They are all perfectly round. The holes are drilled well, and drilled through the center. There are no chips at the hole. There is good coloration, and the coloration from bead to bead is very consistent.

In that \$28.00 strand, none of the beads measure 6mm. They are a bit smaller, perhaps 5.5mm. The beads from bead to bead on the strand are not consistent. Sizes are approximate, not exact. Several beads on the strand are not perfectly round. Some have flat surfaces on them. There are many chips at the hole, suggesting that they are not drilled well. Some are drilled off-center. The coloration is good from afar, but a close exam reveals that some beads are less desirable than others.

This situation doesn't present an easy choice, however. If you are making fashion jewelry, the less expensive strand might be the best choice. Fashion jewelry is not worn for a long time. It is not an investment. It is a look. These beads are less expensive. In this context, the flaws, in this case, may not be so much as a *flaw*, as more a *variation*. The variations might enhance the fashion piece, adding a sense of fun, surprise and funkiness. The poorly drilled holes might mean that these beads will crack and break from wear, but given that fashion jewelry is not worn for a long time, this is a non-issue.

If you are making a more investment quality piece, the more expensive garnet beads might be the better choice. They have more value, resulting from the higher quality. The consistency in quality results in a more classic, timeless look. These beads will last a long time. Here, the inconsistencies in the less expensive strand of beads definitely would be viewed as *flaws*, not *variations*.

Types of Materials

One of the most fundamental and practical aspects of jewelry design is the importance of the materials. The choices jewelry designers make when selecting

materials influence the form, content and movement of their pieces. Every material brings something special to the creative process and the finished jewelry pieces. The material influences, not only the designer, but the wearer and viewer themselves, how they perceive it, the values they place on it, and the extent they desire it.

The types of materials jewelry designers might choose are only limited by the imagination of the designer, and that designer's budget. I have compiled a short listing of the more prevalent materials used in jewelry design. I distinguish those materials called

– ***Stringing Materials*** –

which are used to form the canvas of our jewelry,
from those materials called

– ***Aesthetic Materials*** –

which form the primary visual vocabulary and expressiveness of the piece, but also may contribute some functionality,

from those materials called

– ***Functional Materials*** –

which solely or primarily have practical value, but only sometimes, most likely inadvertently, add to the aesthetic expression of the piece.

STRINGING MATERIALS (*The Canvas*)

The canvas is the part of the piece of jewelry onto which things are placed. The canvas is usually some kind of stringing material, and the things placed on it typically are beads and charms. The canvas supports the piece, its shaping and

its silhouette. It may or may not be visible in the piece. But the canvas can be anything, including fabric and ribbon, wire mesh, chains, and the like. It can be like a string, or it can be like a flat sheet.

The designer selects the canvas or stringing material based on a vision of the structure of the piece, including both its supportive requirements as well as its appearance-related qualities. The particular selection will also impact the durability of the structure. Sometimes the selection of canvas takes on a symbolic meaning, such as using hemp in friendship bracelets or antiwar jewelry, or using leather in biker jewelry.

(1) **Beading thread:** Typically shaped like a typewriter ribbon, made from bonded nylon. It is something we wax before using it. Materials are strung onto thread using a beading needle. The thread is attached to the clasp assembly by tying knots. Glue should never be applied to these knots. If the beading thread is twisted, rather than bonded, it will break very easily.

Structure: Piece is very supple and moves, drapes and flows very easily. Provides little resistance to the weight of materials placed on it

Durability: Very durable when waxed, unless the holes of beads are very sharp

(2) **Cable thread:** This is a material where threads are braided together and encased in a nylon sheathing. Used similarly as beading thread. You use a needle. Waxing is optional, but strongly suggested. Unlike beading thread, you only need to pass through each bead once. You tie knots to the clasp assembly. Glue should never be applied to these knots. Cable thread sold in bead stores is non-biodegradable. That sold in fishing stores or fishing departments is biodegradable.

Structure: Piece is very supple and moves, drapes and flows easily, but not as easily as with beading thread.

Durability: Very durable, but the nylon sheathing can be compromised easily from body oils, perfume oils, and cosmetics. Waxing will protect the nylon sheathing.

(3) **Bead cord, hemp, knotting cord:** This is a material where threads or fibers are braided or twisted together so that they look pretty. This cord is used when you want the stringing material to show, such as putting knots between beads, or where you have a cluster of beads, then the cord showing, another cluster of beads, the cord showing, and so forth. You use this material to macramé, knot, braid, knit, and crochet. You do not wax this material. That would make it look ugly. The primary purpose is to make your piece look attractive when the stringing material is to show. Bead cord may be nylon or silk. You use silk with real pearls, but and, I suggest using the nylon with other materials. You will need a needle, usually a collapsible eye or big eye needle. You tie knots to secure the cord to a clasp assembly. You minimize the use of glue applied to knots, but you usually need to apply glue to the final knot.

Structure: Piece is a little stiffer than with bead thread or cable thread, but still feels supple. Will drape well, but respond imperfectly to the movement of the body.

Durability: Silk naturally deteriorates in 3-5 years; nylon does not. Bead cord made from other natural materials will also deteriorate over a relatively short period of time.

(4) **Cable Wires:** This flexible stringing material consists of wires braided together and encased in nylon. The strength comes from the ability of the nylon sheathing to keep the twist in the wires. If the nylon sheathing is compromised in any way, the wires will immediately untwist and the cable will break at that point. The wire is stiff enough to be its own needle. You use crimp beads to secure the cable wire to a clasp assembly because it is more difficult to tie a secure knot with the cable wire. A crushed crimp adds a more pleasing appearance than tying a knot, but it adds risk. A crushed crimp is like razor blade, always trying to saw right through the cable when the jewelry is worn.

Structure: Piece will be stiff, and never take the shape of the body. Piece will typically rotate in the opposite direction from the movement of the body or arm it rests on.

Durability: Very durable. The nylon sheathing can be compromised easily from body oils, perfume oils, and cosmetics. Usually crimp beads are used to secure the clasp, and these increase the risk the cable will break at the crimp, when compared to the durability of tying a knot.

- (5) ***Stretchy Cords, like elastic string, gossamer floss, elastic cord:*** These materials are not particularly durable and lose their elasticity over time. People like these because they hate clasps, and you don't use clasps with these. You secure these by tying knots, and putting glue (any glue except superglue) on the knots. Be sure to coat the bottom of the knot, as well as the top of the knot. Elastic cord is fabric covered around an elastic thong or floss.

Structure: Piece will stretch and return back to its original shape and size.

Durability: Material deteriorates and loses both its integrity as well as its memory over time, especially if left exposed to the air, or worn frequently. The round elastic string is the most durable among the stretchy cords. The floss is the least durable.

- (6) ***Thicker cords like leather, waxed cotton, ultra suede lace, rubber thong, and rat tail (satin cord):*** These cords are stiff enough to be their own needle. You usually need special jewelry findings, such as crimp ends, end caps, or cones with larger interior openings, to prepare the ends of the thicker cord, so that you can attach a clasp assembly. Some are glued on; some crimped.

Structure: Similar to bead cord, but little stiffer.

Durability: Some cords, like leather, dry out over time and crack. Other cords, like waxed cotton and ultra suede, last a very long time. The rat tail tends to shred.

- (7) ***Hard Wire:*** Hard wire is not a stringing wire, per se. You can use it to make a chain or bead-chain. You can use it to make shapes, like clasps and ear wires. You can bundle it so that it might be stiff enough to retain the shape of a bracelet or cuff. You can create caged or bezel settings for

stones. You can weave it or knit it to create patterns and textures. You create loops and rings to attach hard wire to a clasp assembly.

Structure: Wire stiffness comes as dead soft, half hard and hard. You determine, given how much manipulation of the wire you plan on doing, how stiff you want the wire to be when you begin your project, so that it will hold and retain its shape. Each time you manipulate the wire, it becomes stiffer and stiffer and stiffer, until it becomes brittle and breaks.

Durability: Very durable. Wire 18 gauge or thicker has little risk of losing its shape, distorting, breaking, opening up or pulling apart. As you get thinner, the risk increases dramatically. Dead soft wire requires a lot more manipulation until it can hold its shape, than half hard or hard hard wire.

(8) **Chain:** Wire is bent into links of various shapes and sizes, and these are interlinked together into a chain. Sometimes the links are soldered closed. Usually they are not. You can string things onto the chain. You can use the chain as part of the clasp assembly, often to make the size adjustable. You can use the chain as a design element throughout your piece.

Structure: Thinner chains will be less able to keep their shape.

Durability: Chains can be very durable, particularly ones that have soldered links, wider links, and/or links created from thicker gauge wires.

(9) **Ribbon, fabric:** These wider cords are sometimes used as a stringing material. They are secured at each end with ribbon or bar clamps, which then form either side of your clasp assembly.

Structure: Usually, these don't by themselves support a shape.

Durability: More aesthetic than functional

(10) **Lacy's Stiff Stuff, Stiff Felt, Ultra suede sheet, Paper, Card Board, Poster Board, Rolled Out Polymer or Metal Clay, Brass Cuff Blank:** The canvas or stringing material does not have to be a narrow cord. It can be a wide, flat surface, off of which to bead, glue, stitch, embroider, carve, or sculpt. This type of canvas needs to have some amount of stiffness to hold a shape, but not too much that the jewelry made with it feels uncomfortable, or does not move naturally with the person.

Structure: If you were creating a pendant, you might want your canvas to be a little stiffer than if you were creating a bracelet.

Durability: Average durability

(11) Fused Glass: Sometimes the flat canvas is a piece of glass. Other pieces of glass are fused onto this, using a kiln, in order to create a pattern or image.

Structure: Rigid shape.

Durability: Same as any other piece of glass.

(12) Metal Sheet and Wire: Sometimes we fabricate a piece of jewelry, either using soldering, stamping, molding, casting, 3-D printing, or cold connections. Part of the sheet and/or wire becomes our canvas or stringing material.

Structure: These are very reliable materials for creating and maintaining shapes.

Durability: Soldered and stamped pieces are much more durable than molded or cast ones. 3-D printed materials would be used with casting. Cold connections could be used with any technique.

AESTHETIC MATERIALS

The canvas either passes through various aesthetic materials, or these are applied to the canvas or attached off the canvas in some way. These aesthetic materials are used for the yoke, the clasp assembly, the frame, the focal point, the center piece, the strap, and the bail.

Aesthetic Materials are expressive. They are part of the visual vocabulary and grammar of the jewelry. While some play functional roles, as well, they are usually selected for their expressive powers. Some materials evoke sensory or symbolic responses, as well. A touch, a feel, a color sense, sometimes a smell, which extends beyond its factual elements.

Any type of material can be selected to use as an aesthetic material. It can be something very specific, or a found object, or some kind of combination of things.

Aesthetic Materials we see often include,

- Glass, Fused glass, lampwork glass, blown glass
- Metals and Plated Metals
- Fibers
- Natural (gemstones, wood, bone, horn)
- Synthetic (plastic)
- Polymer and Precious Metal Clay
- Ceramic, Porcelain, Clay, Raku
- Paper, lacquered paper
- Oxidizers, Patinas, Paints, Fabric Dyes and Paints, Stains, Metal Paints and Rouges
- Platings, Coatings
- Enameling

These aesthetic materials can be selected for their qualities of

- (a) Appeal
- (b) Functionality
- (c) Sensations or symbolism extending beyond the physical and decorative bases underlying these materials

Aesthetic Materials: Appeal

The idea of appeal is a broad concept. It is sometimes universal. But often subjective.

There are many variables underlying the ideas of appeal and beauty. These include things like,

- Clarity, translucence, opacity
- Hardness, brittleness, softness, suppleness

- Malleability
- Luminescence, brightness, reflectiveness, refraction
- Color, color combinations, intensity, value
- Weight, lightness, heaviness, volume, density
- Perceived value, worth, rarity
- Cut, faceting, smoothness, carving, sculpting
- Shapes
- Direction, pointer, focal points, markings, striations, inclusions

Aesthetic Materials: Functionality

Some materials function better than others in certain situations. For example, sterling silver is very malleable, nickel is more brittle. Bending, shaping, coiling, weaving sterling silver requires much less effort, and with this, can lead to more artistic and design success, than using nickel or other wire material that is stiffer and harder than sterling.

Another example: Using needle and thread as your stringing material is very time consuming. It is awkward using needle and thread. You have to wax it. You want to pass through each bead a minimum of three times. Using a cable wire, instead, lets you go much faster. The cable wire is a self needle. You don't wax it. You only have to go through each bead once. If you are selling your pieces, it is virtually impossible to get your labor out of a needle and thread project. You almost have to use a cable wire, if you don't want to commit yourself to a life of slave labor.

Aesthetic Materials: Sensations and Symbolism

Materials have sensory and symbolic powers which extend beyond the materials themselves. Obviously, this can be very subjective. It might have psychological roots, sociological roots and/or cultural roots.

Things may feel warm, cold, soft, rough, oily, weighty. Things may represent romance, power, membership, religiosity, status.

Vanderbilt University's colors are gold and black, so using those colors in the Nashville, TN area might evoke a different emotional response than when used elsewhere. And there's that very-difficult-to-design-with University of Tennessee orange, again, in the Nashville area will evoke a very different response than elsewhere.

Materials like amber and bone and crystal are things people like to touch, not just look at. The sensation extends beyond the visual grammar.

FUNCTIONAL MATERIALS

These materials are used in practical terms. They help things hold together. They help pieces stay in place. They help make pieces adjustable in size. They help polish, finish things off, assist materials through stages in their processing and development. They may be used to prevent or retard a change in color, such as a lacquer finish or rhodium plating over sterling to prevent tarnishing. They help capture a form or shape. They are not a part of the visual and expressive vocabulary and grammar of the piece. Nor are they any kind of canvas.

Functional Materials which are more prominent include,

- Adhesives
- Solders
- Pickling, Flux
- Molding compounds
- Bead release
- Fixatives (like Krylon, lacquering, special platings, waxes, other things which create a protective barrier over something else).

It is especially important to know a lot about adhesives. Many people reach for a tube of Superglue for everything. Superglue has few uses in jewelry design. This glue dries like glass, so the bond is like a piece of glass. When the jewelry moves, the bond shatters like glass, and the bond looks like a broken piece of glass. All jewelry moves when worn, so not a good choice.

Another glue many people reach for is hot glue. This glue melts at body temperature, so not a wise choice for necklaces, bracelets and pendants.

The best glue to use is jeweler's glue. Two brands are E6000 and Beacon 527. Basically the same glue, but the former is thick and the latter is runny. These glues take 10 minutes to set, so you can move things around for 10 minutes. At about 20 minutes, the consistency is like rubber cement and you can use your finger or a tweezers to take off any excess glue. Both glues take 24 hours to dry hard. They dry clear and remain clear over time. The bond does not expand.

If using fabric, particularly silk (ribbon, bead cord, thread), you want to use a cement, rather than a glue. Glues work by forming a collar around an object, then tighten up as the water or other solvent evaporates. Cements work by adhering to each individual fiber. Glue on fabric, as opposed to cement, will lose its grip, so to speak. With silk, I suggest either G-S Hypo Fabric Cement, or any fabric glue.

Before using a glue, you want to know the characteristics of the bond, once dried. These include things like,

- hardness
- whether dries clear, or yellows
- whether yellows with age
- whether it expands or not when it dries
- what materials it is most useful for
- whether you have to prepare the material's surface before using
- how long it takes to fully set
- how easy it is to wipe away and remove any excess glue
- whether where-ever you purchase the particular brand of glue, such as at a craft store or discount store or bead store, that this brand of glue is the

same quality product

- how long the glue will last in its container before hardening or drying out

Besides the importance of knowing the **types of materials**, it is also important to know the **properties of materials**. These include (a) mechanical properties, (b) physical properties, and (c) chemical properties.

Mechanical Properties

Mechanical properties describe how a material reacts to an applied force. These include,

- **Strength:** It's ability not to break under stress or strain
- **Hardness:** How easily it can be scratched, faceted, carved, sculpted, cut, sand blasted
- **Elasticity:** The ability to regain its shape after a stress has been applied to it
- **Plasticity and Malleability:** How much force it takes to make a material permanently deform without breaking
- **Stiffness and Brittleness:** At some point, these materials will be so brittle, they will not bend, and will just break in response to force. Wire materials, for example, get stiffer and more brittle, the more they are worked, such as from twisting, pulling, hammering, coiling and the like. Crystal is much more brittle than glass, so it more likely to break from movement or other force.
- **Fatigue:** When the material fails, after repeated wear and use
- **Impact Strength:** how much a material can withstand an impact
- **Abrasion Resistance:** When two materials rub against each other, what is the resistance before one or both break
- **Creep:** the slow movement of a material over time

Physical Properties

Physical properties describe the inherent nature of the material. Some more important ones related to materials used in jewelry include:

- **Density:** mass and volume
- **Porosity:** the quality of being full of tiny holes; these might hold in something, like a perfume oil, or that something might easily leach out through washing or sweating, like a dye or lead
- **Water absorption, permeability and solubility**
- **Softening and Compression:** how material holds up under different conditions
- **Resistance to Heat and Fire**
- **Resistance to Cold**
- **Resistance to a number of cycles of sharp temperature variations without failing**
- **Changing form from solid to liquid to gas**

Chemical Properties

Chemical properties refer to how well the material holds up when exposed to chemicals. These chemicals may be in the air. They may be present in cosmetics, perfumes or hair sprays. They may be present in a person's sweat. These include,

- Corrosion
- Melting, Dissolving, Removing
- Etching
- Colorizing, Oxidizing, Patinas
- Platings

- Bonding, Adherring
- Biodegrading

We have looked at types of materials and their properties. Now we need to understand how materials help establish the viability, finish and success of jewelry. Here our materials selection process begins to incorporate some value judgments.

Materials Help Establish the Viability, Finish and Success of The Jewelry

Jewelry has character and personality. It is communicative. It is interactive. It evokes emotions and resonates. Within each piece is displayed intent, content, meaning, expression, and contextual relevance.

People intuitively or consciously recognize when it is finished, that is, when the addition or subtraction of any one design element would make the piece seem less satisfying or desirable.

Jewelry is judged as successful, to the extent it can maintain its shape while concurrently feeling comfortable, and moving, draping and flowing with the person, as the person wears the jewelry and moves with it on.

Every piece of jewelry has its artistic and individual character due to the many facets from which it is constructed. Stringing, Aesthetic and Functional Materials are three of these facets. Mechanical, Physical and Chemical Properties add some additional facets. These among other additional material choices determine both what can be made, as well as the character of what is made.

Material selection in jewelry design is not only about choosing the most attractive, or most obvious, or most affordable, or most durable materials available. Designers also choose materials for their sensual sensations, like warmth, their formal appearance, like classical, their functional practicality, like a clamp, or their geo-locality, like using materials found locally.

The material selection process is complex. It is influenced by many preconditions, choices made, and considerations to accommodate. Too often, however, designers focus mainly on the visual aspects of the materials, and not enough on other factors. In order to make well-considered and smart choices about materials, jewelry designers need a lot more information. They need information about the entirety of the material, as created or constructed, as visually impactful, as functionally helpful, as perceptually and cognitively understood and as symbolically relevant for designer, wearer and viewer.

Selecting Materials Is A Complicated Process			
MATERIAL <i>(type and property)</i>		JEWELRY MAKING	
- stringing - aesthetic - functional	- mechanical - physical - chemical	- production process - assembly, fabrication, construction - finishing - accommodating temporal issues - cost	
EXPERIENCE		CONTEXT	
- sensorial - perception - association and symbolism - emotion and resonance		- of use - physical - historical and geographic - socio-cultural and psychological	
PERSPECTIVE			
- artist - wearer - viewer - seller, buyer, exhibiter, collector, student, teacher			

Stringing, Aesthetic, and sometimes, Functional Materials, coupled with their various Mechanical, Physical and Chemical properties, help to:

- (1) Establish a relationship between visual quality and structural stability
(physical properties, shape, silhouette)
- (2) Establish a relationship between visual quality and support or jointedness
(movement, drape and flow)
- (3) Influence the selection of the appropriate technique
- (4) Provide character and visual appeal
- (5) Reflect the time, era, and socio-cultural context and historical value of the piece
- (6) Mix aesthetic elements with functional ones
- (7) Highlight a theme or concept expressed in the design
- (8) Link the piece to a particular geography or location
- (9) Link the piece to its appropriate placement on the body
- (10) Determine the budget for the piece
- (11) Establish the relationship between quantity and quality, that is, how many similar pieces can be made
- (12) Best combine the materialistic qualities with the non-materialistic qualities of the project

***(1) Establish a relationship between visual quality and structural stability
(physical properties, shape, silhouette)***

Jewelry making materials signify *structural significance*. This may relate to the physical properties of the materials, such as hardness, brittleness, softness, pliability, porousness, and this list can go on and on. This may relate to the shapes of the materials, and the placement and interaction of the shapes within the piece, or the final silhouette. The same may be said for size, weight and volume. This may relate to the stability of the material or its color or finish over time.

The choices and arrangement of materials within a piece of jewelry determines its structure. Structure means shape and material integrity. Shape in jewelry may refer to the silhouette of the piece as a whole, or to individual shapes which occupy one or more sections of our finished piece of jewelry. It may refer to the positioning of positive and negative areas within the piece. When we refer to structure and shape and material, we imply structural integrity, and the degree we are able to maintain any shape, color or finish while the jewelry is worn over some period of time.

Example 1: We may create a bracelet using Austrian crystal beads strung on a beading thread. We achieve a high visual quality, at least initially. But these beads will cut through the threads when the bracelet is worn, thus ending with a very low structural stability.

*Example 2: Sometimes a clam-shell bead tip is used to finish off each end of bead cord, when that is the stringing material. The bead cord, at its end, is tied into a knot, which sits inside the clam-shell, the cord coming out a hole in the bottom of the clam shell. We do not want the knot to work itself loose and slip through the hole. So we glue it. If we use a jeweler's glue, like E6000 or Beacon 527, these glues dry like rubber. With these glues, the knot can actually contort and work itself through the hole. If we use a glue like Superglue or G-S Hypo Cement, the knot will remain stiff and not be able to slip through the hole. However, the stiff knot reduces what is called **support**. It reduces the piece's jointedness, or ability to respond to stress and strain, thus an ability to best move, drape and flow. An alternative to glue is to thread an 11/0 seed bead, passing through the bead twice, before bringing the cord through the hole. This is secure. No glue is used at all. Full support is preserved.*

Example 3: How long a metal plated finish lasts depends partly on the metal underneath it, and if it bonds to that metal. Metal plating bonds well to brass, so it lasts a long time before it fades away. Metal plating does not bond at all to aluminum, so it quickly chips off.

(2) Establish a relationship between visual quality and support or jointedness (movement, drape and flow)

Jewelry making materials enhance or impede support or *jointedness*. The selection and placement of materials, their density, weight, shape, and the like may enable the jewelry to take the shape of the body and move with the body, or not.

Things strung on beading thread will always take the shape of the body and move with the body; things strung on cable wire will not. But the designer has at their disposal several jewelry design tricks in construction which will make the cable wire function closer to needle and thread.

*Example 1: A bracelet made up of very large beads, that when encircling the wrist, create a very stiff circle, with much strain and stress on each bead, on the stringing material and on the clasp assembly. If the designer reworks the piece, to include small round spacer beads between each very large bead, the designer, in effect, has added what is called a **rotator support system**. Each very large bead can freely respond to stresses and strain which result from adjusting to the body and its movement by rotating and pivoting around the spacer bead.*

Example 2: People usually pick a clasp after they have designed their piece. They look for something that will make do, perhaps easier to get on and off, and hopefully have some match to the piece. A clasp, however, should be understood as more than a clasp. It should be understood as a clasp assembly, which is a type of support system. The clasp assembly includes the clasp and everything else it takes to attach the beadwork to the clasp, like rings, loops, rivets, and the like. S-clasps are very attractive and a S-clasp design can always be found that feels an organic extension of the jewelry. An S-clasp needs a soldered ring off of each arm, and, if stringing on cable wire, a loop in the wire where it connects to the soldered ring. The crimp is never pushed all the way up to the clasp or ring. Each ring or loop is a support system or "joint", so our S-clasp needs 4 support systems in this case, to function correctly. With 4 supports on the S-clasp in a necklace, the clasp will always remain on the back of the neck, no matter

how the person moves. Without 4 supports, it will not, and the necklace will keep turning around.

(3) Influence the selection of the appropriate technique

The designer must coordinate the selection of Stringing, Aesthetic and Functional Materials, and their inherent Mechanical, Physical and Chemical properties, so that they work in harmony with a particular technique used to assemble, weave, or otherwise secure them together in a finished piece of jewelry.

Conversely, the technique might dictate which materials will work best, and which will not. Bead weaving works with thread or cable thread, but not as easily with elastic string or cable wire.

There was a time when the materials used in any one piece were restricted to a few. Today any material can be used, as well as any combination of materials, without losing any appeal or value or desire.

Examples: A Czech glass bead with a hole size of .8mm would not slip a leather cord with a diameter of 1.5mm. It would be very difficult to create a loomed piece with beads of widely varying sizes. If mixing metals (say, silver, gold and brass) in a fabricated and soldered bracelet, care must be taken in the soldering strategy because each metal melts at a different temperature. You could not begin a wire weaving project using hard hard-wire. We may select cable wire for our canvas. This would not be a suitable stringing material if the technique we wanted to apply was bead weaving.

(4) Provide character and visual appeal

The surface of a material has many characteristics which the jewelry designer leverages within the finished piece. Light might reflect off this surface, such as with opaque glass or shiny metal. Light might be brought into and below the surface before reflected back, such as with many gemstones and opalescent glass.

Light might refract through the piece at different angles, even creating a prism effect.

The surface might be a solid color. It might be a mix of colors. It might be matte. It may have inclusions or markings. It may have fired on coloration effects. There may be tonal differences. There may be pattern or textural differences. It may have movement. It may have depth.

Example: It is often difficult to mix gemstone beads with glass beads. However, if you use glass beads which have a translucent quality to them, this glass mimics the relationship of light reflecting back to the eye with that of the gemstones. The finished piece will feel harmonious.

(5) Reflect the time, era, and socio-cultural context and historical value of the piece

Jewelry and its design and materials used can be iconic.

Jewelry can relate the symbolic value of the piece to certain historical themes and ideas, or to specific functions.

Jewelry can be used to preserve, conserve or restore certain cultural or historical values. The material(s) selected may glorify these. Their availability may be closely tied to the time and place. Their use within a piece may be socially subscribed.

Our understanding of how jewelry relates to these contexts can be used to document how jewelry and its design has evolved and spread.

Name an historical period, and you can visualize many of the materials used and design sense. Roman. Victorian. Prehistoric. Modern.

Name a socio-cultural context. Religious. Wedding. Military. American Southwest. Any rite of passage.

Example 1: Pearl knotted jewelry is very strongly associated with silk bead cord, pearl clasps, and bead tips. It is also very associated with Victorian

jewelry. It would be difficult to substitute other materials and pieces, such as a different kind of clasp, or not knotting between beads, without the piece losing its appeal.

Example 2: A rosary is made as a bead chain, with a certain number of beads, often a certain size and material of bead, with a Y-shaped connector at its center. The rosary assists the wearer in prayer and religiosity. It's specific design and use of materials differentiates Catholicism from other religions.

(6) Mix aesthetic elements with functional ones

Jewelry is art only as it is worn. Its aesthetic elements must tightly coordinate with its functional ones, if the piece is to maintain its shape and silhouette, and move with the person, without distorting, feeling uncomfortable or breaking. Thus, its quality and durability are dependent upon how the designer successfully maneuvers the tradeoffs required between function and appeal. A good part of this success stems from how materials are selected, combined and arranged.

Jewelry and its design preserve the aesthetic qualities, without disrupting and losing focus of the practical ones.

Example: The clasp assembly on a piece of jewelry can be very organic, feeling an integral part of the piece. Or it can be very disruptive and annoying, as if it were a last choice and consideration, and the designer found a clasp that would make do. For an S-clasp to function appropriately, it needs at least one soldered ring off of the arm on each side of the clasp. This will force the clasp assembly to take up more space and volume in the piece. This too might end up detracting from the overall appeal of the piece.

(7) Highlight a theme or concept expressed in the design

Materials may be selected, combined and arranged into forms and themes so that they represent larger meanings and concepts. Often this comes down to color, shape, placement, and arrangement. The materials bring out the theme or concept in the design.

Example: You create a piece of jewelry with a blue color scheme, using 4 shades of blue. If the piece is to be worn, say, going clubbing in the evening, you might select 4 shades of blue (metallic blue iris, montana blue, blue quartz, cornflower) which vary in intensity. That means, varying how bright or dull they are by selecting tones with more or less underlying black, gray or white. If the piece is to be worn, say, at work during the day, you might select 4 shades of blue (cobalt, sapphire, light sapphire, ultralight sapphire) which vary in value. That means, varying how light or dark they are by selecting tones that are basically the same, but some are lighter or darker than others.

(8) Link the piece to a particular geography or location

Materials may be strongly associated with a particular geography or location. Lapis is strongly associated with Afghanistan. Paint Rock with Tennessee.

Example: A necklace by a Tennessee designer made entirely with lampwork beads made by Tennessee artisans.

(9) Link the piece to its appropriate placement on the body

Jewelry can only be judged successful at the boundary between jewelry and the body. It must be able to conform to the body's shape. It must be able to comfortably move, drape and flow as the person moves and shifts positions.

Materials selection might begin with what materials would be most appropriate for a given type of jewelry. Or it might begin with what materials would be most appropriate for a certain body shape or size or placement.

Example: Very heavy beads used in earrings can make them uncomfortable. Creating a 4" earring dangle on a 4" head pin is not quite as good a strategy as making a 4" earring dangle chain using eye pins. Think about what happens to the former vs. the latter when the wearer bends her head, then returns to the upright position.

(10) Determine the budget for the piece

The total expenditure incurred while designing a piece of jewelry might be, to a large extent, determined by the materials used. A designer often selects the material type based on a budget for the project. *[Techniques can also have a big impact on the cost, particularly when accounting for the time it takes to design and construct a piece of jewelry.]*

Example: A necklace made entirely of lapis lazuli beads might retail for \$150.00. A similar necklace made entirely of lapis color glass beads might retail for \$25.00. Both would look similar and take the same time to make.

(11) Establish the relationship between quantity and quality, that is, how many similar pieces can be made

The choice of materials affects the quality of the elements. Within a given project budget, and within a particular design goal, the quality of the materials may limit the number of similar pieces to be made, or the complexity or elaborateness of the design of any one piece.

Example: A stretchy bracelet made with lava beads might retail for \$15.00. The materials – elastic string, lava beads, glue – are readily available and inexpensive. The designer could easily make 50 of these to sell, and stay within a reasonable budget. Change the materials to cable wire, crimp bead,

horseshoe wire protector, crimp cover, black onyx beads, toggle clasp, and the investment in parts is considerably more. We have more materials and more expensive materials. This bracelet might have to retail for \$45.00. Staying within the same budget framework, the designer would only be able to make 16 of these.

(12) Best combine the materialistic qualities with the non-materialistic qualities of the project

Every material has two over-arching qualities. The obvious is its physical properties and physicality. Let's call this *materialistic*. It is something that is measurable. In the realm of the mystic, it is ordinary or profane.

But the material also has qualities that extend beyond this. They can be sensory. They can be symbolic. They can be psychological. They can be contextual. Let's call this *non-materialistic*. It is something that is non-measurable. In the realm of the mystic, it is extraordinary and sacred.

Both properties must be considered when designing a piece of jewelry. They have equal importance, when selecting, placing and arranging materials and design elements within a piece.

Example: Take a Chakra bracelet strung on cable wire with a clasp. The beads used are gemstones. Each gemstone has spiritual and healing properties. Each gemstone has a coloration, and each different coloration, too, is associated with certain spiritual and healing properties. Moreover, every individual has their own unique needs for which set of gemstones and which assortment of colorations are best and most appropriate. This can get even more complicated in that each situation and context may have its own requirements. The person may end up needing several Chakra bracelets for different occasions. The designer could have used glass or acrylic beads, instead, which have less non-materialistic value, and might be less durable over time. The designer could have strung the beads on elastic string without using a clasp, again, less non-materialistic value and durability.

LESSONS LEARNED

Selecting materials involves a complicated set of choices, some tangible, some intangible, some personal, some in anticipation of the perceptions of others.

Some lessons learned...

1. *You can use any material you want when designing jewelry*
2. *Material selection is a complicated decision making process*
3. *No material is perfect for every project*
4. *Don't assume you know what you know*
5. *Be skeptical*
6. *Always ask questions*
7. *Select materials on both their aesthetic as well as functional properties*
8. *Don't sacrifice functionality for aesthetics*
9. *Anticipate what might happen to your materials over time as the jewelry is worn*
10. *Anticipate how your various audiences will respond to your selections of materials*
11. *Work within a budget*
12. *Match the quality of material to your design (and marketing) goals*

FOOTNOTES

- ⁽¹⁾ WASTIELS, Lisa and WOUTERS, Ine. Material Considerations in Architectural Design: A Study of the Aspects Identified by Architects for Selecting Materials. July, 2008.

As referenced in:

<http://shura.shu.ac.uk/511/1/fulltext.pdf>