



Frame Materials

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Contemporary eyeglass frames are available in an enormous selection of styles, sizes, and materials. For those who are fashion-minded, there are numerous designer styles. Children's and safety frames are now obtainable in materials that are nearly indestructible. New materials and design technology have made frames more lightweight and comfortable. Let's explore some of the options available to today's eyeglass consumers."

Plastic frames

Most plastic eyeglass frames are made of zyl (also called zylonite, acetate and cellulose acetate) or propionate. Other materials used in plastic frames include polyamide, nylon, polycarbonate, carbon and Optyl (a brand of epoxy resin). Propionate, polyamide, nylon and Optyl frames are all considered hypoallergenic.

Cellulose acetate (zylonite): The most commonly used plastic in eyeglass frames, cellulose acetate is relatively inexpensive, easy to work with, and comes in a wide variety of colors, textures, and patterns. The material is easily adjusted, but tends to get brittle with age. Frames made from cellulose acetate are commonly called "Zyl frames."

Nylon: Nylon is lightweight, flexible and virtually unbreakable, so it is often chosen for sports and safety applications. Typically made of gliamides, grilamid or trogamid materials that are very resistant to hot and cold and are more flexible than other materials, nylon is easily molded into today's popular wraparound styles, as well as

other shapes that are otherwise difficult to produce. Disadvantages of nylon are: it can be manufactured only in darker colors, it is difficult to adjust, and frames can become brittle over time.

Cellulose propionate: This is a lightweight material that can be injection-molded, making it ideal for intricate designs. Care must be taken when heating and adjusting frames made with this material, because it will shrink with overheating. If this occurs, a lens may no longer fit.

Kevlar®: Developed by DuPont for use in bulletproof vests, this plastic can withstand high impact, such as that experienced in sporting events. The material is limited because it will not shrink or stretch, and it comes in few colors.

Optyl: This material is somewhat lighter in weight than cellulose acetate and is hypoallergenic -- an advantage to skin-sensitive patients. However, frames made with optyl are more difficult to adjust because the material can return to its original molded shape, and the frames may break easily if not heated properly.

Although there are many positive aspects to plastic frames such as being less expensive and trendier there are also some drawbacks common to plastic frames. They are easier to break than metal frames, they will burn (but are not easily ignited), and aging and exposure to sunlight decrease their strength slightly. Color can fade over time, but not as much with modern materials.

Metals

A wide assortment of metals are being used for frames. Metal frames have their front and temples comprised of metal. Below are a few of the common metals used in frames.

Monel

Monel is composed of about two-thirds nickel and one-third copper. This highly-yielding alloy can be hammered into a variety of different shapes without losing strength. Its ability to resist stress well makes monel an excellent choice for stabilizing frame bridges and end pieces. Monel is corrosion-resistant and durable, but may cause problems for people with allergic reactions to nickel.

Titanium

Titanium is extremely lightweight and will not rust, making it a very popular material for eyeglass frames. Titanium's strength allows it to be made thin, but it is hard to solder or weld, and it is expensive. While titanium is known for its beneficial qualities of strength, lightness, and flexibility, it is more expensive than other metals and is restricted in its range of colors.

Eyeglass frames that are 100 percent titanium are hypo-allergenic, making this material a good choice for individuals with allergies to other eyeglass materials. Many designer frame brands use titanium in some part of their collection.

Titanium Ti-227: Titanium Ti-227 is nearly 50 percent lighter than most metal frame materials. It is hypo-allergenic, non-corrosive, and one-third stronger than steel, making it an extremely desirable material for manufacturing frames. However, Ti-227 is difficult and expensive to extract and refine.

Aluminum: Although very lightweight, aluminum is difficult to solder or weld, limiting its adaptability to different designs. Aluminum is cut from a block, lightweight, and low in density. Aluminum can accept a variety of colors, and chemical anodizing is sometimes used to create black, brown and gold colors. Because aluminum cannot be easily welded or soldered, end pieces, hinges, and nose pads must be fastened with rivets or screws, increasing the chance of frame breakage. Aluminum is also very stiff, which limits its versatility.

Cobalt: Usually used as part of a metal alloy, cobalt appears in high-quality frames that can be lightweight, durable, flexible, and thin. It can also be successfully coated with a variety of colors, but is very expensive, and consequently limited in use.

Nickel silver: This is a common material used in hinges, end pieces, and heavy bridges, and for the inner core of temples. It is more brittle than other metals, making it less suited to popular slender frame designs.

Stainless steel: Stainless steel is comprised mostly of iron, with a mixture of nickel, manganese, and chromium. Stainless steel is highly lustrous, and makes a good thin and sturdy frame with strong corrosion resistance. Although it is hard to make eyeglass frames with stainless steel due to soldering and welding difficulties, stainless steel temples are especially springy. Qualities of stainless steel frames include light weight, low toxicity, and strength. Many stainless steel frames also are nickel-free and thus hypoallergenic. Stainless steel is readily available and reasonably priced. Most stainless steels contain anywhere from 10 to 30 percent chromium, which provides excellent resistance to corrosion, abrasion and heat.

Flexon® is a trade name for one company's flexible eyeglass frame material. Flexible frames are available in many compositions, but the goal is always the same - reduce breakage. Flexon is normally found in the shaft of the temple and in the bridge, and it allows these areas to endure tremendous twisting without breakage or permanent distortion of the frames shape. Flexon7 is a proprietary material made from a titanium-based alloy with a high "memory" factor that enables a twisted frame to return to its original shape. In addition to making frames extremely durable, the Flexon material holds adjustments longer and is lighter in weight than traditional metal frames.

Unusual Frame Materials

For people who want distinctive style and are willing to pay for it, frames come in materials such as silver, gold plate, leather, wood, and bone. High-end optical boutiques will be the best hunting grounds for this unique and sometimes pricey eyewear.

Solid **silver** or sterling silver is not used commonly as a principal frame material because it doesn't make very wearable or comfortable frames. Sometimes, silver is used as a trace element in metal alloy frames and often provides a jewelry-like accent on plastic frames.

Some companies make **gold** eyewear, typically using gold plating rather than solid gold. Like silver, gold can be used for accenting plastic or metal frames as well.

Wood, bone and **buffalo horn** frames are usually handmade, one-of-a-kind pieces. Wood and bone, though stiffer, less adjustable, and much more expensive than other frame materials, are appealing because of their unique beauty. Buffalo horn frames have an elegant look and warm to your body temperature; they can feel unlike any other frame you've ever worn before.

Often used on temples or across frame fronts, **leather** is not as durable or practical as other materials used for accenting, but it provides an interesting and fashionable look.

Semi-precious or precious stones and crystals are sometimes used as accents in frames, especially in the temples. Popular choices are onyx, turquoise, and Swarovski crystals, but even diamonds can be used for a luxurious touch. Such designs usually are worn in a formal office or on dressy occasions. **Rhinestones** are a less expensive alternative and are often used to create a flashy or retro look, especially in upturned cat-eye style frames.

Allergies to eyeglass frame or nose pads

If metal frames cause a reaction, nickel is usually the culprit because most metal frames are made of a nickel alloy. Other metals used include aluminum, stainless steel, titanium, zinc, copper, beryllium, gold and silver. Stainless, titanium, gold and silver are usually hypoallergenic.

Some people are allergic to the nose pads on metal frames. Most are made of silicone or acetate, but they also can be made of polyvinyl chloride (PVC), nickel, titanium or rubber.

Remember that almost everyone needs eyewear for reading, sunglasses, general purpose eyewear, sports related activities and just for fun. Asking your patient to complete a lifestyle questionnaire will assist you in determining the best recommendations of frame materials. There is an ample selection of materials for eyewear. Understanding frame material benefits and disadvantages will allow you to make the best recommendations for your patients.

1)System for Ophthalmic Dispensing, Clifford W Brooks and Irvin M Borish, Butterworth-Heinemann, Second Edition, 1996 Chapter 1, Pg 2-6

2)Self Study course for Paraoptometric Assistants and Technicians Revised third edition

3www.allaboutvision.com

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Select the option that best answers the question.

- 1) What frame material has two-thirds nickel and one-third copper?
A) Monel
B) Titanium
C) Silver
D) Flexon

- 2) What frame material tends to get brittle with age?
A) Cellulose proprionate
B) Kevlar
C) Aluminum
D) Cellulose acetate

- 3) What frame material has the beneficial qualities of strength, lightness and flexibility?
A) Monel
B) Titanium
C) Cobalt
D) Mesh

- 4) What frame material is cut from a block and low in density?
A) Aluminum
B) Manganese
C) Stainless steel
D) Ti-227

- 5) What frame material's goal is to reduce breakage?
A) Cobalt
B) Flexon
C) Monel
D) Optyl
- 6) What frame material is hypoallergenic and reasonably priced?
A) Chromium
B) DuPont
C) Polyamide
D) Stainless steel
- 7) What frame material can warm to your body temperature?
A) Gold
B) Bone
C) Buffalo horn
D) Leather
- 8) What frame material is ideal for intricate designs?
A) Flexon
B) Gold
C) Stainless steel
D) Cellulose propionate
- 9) What frame material is made of grilamid?
A) Kevlar
B) Cobalt
C) Nylon
D) Flexon
- 10) What types of plastic frames are considered hypoallergenic?
A) Zylonite, Nylon, Epoxy
B) Propionate, Optyl, Polyamide
C) Kevlar, Monel, Optyl
D) Cellulose acetate, Nylon, Optyl