Suitable lenses for rimless and inline frames

How suitable is a particular lens material for rimless dispensing? **Preston Everard** offers his opinions and advice to dispensing opticians

As a dispensing optician, would you recommend mounting a glass lens into a rimless mount? If the answer is no (and I am sure it is), why would you not recommend glass?

You probably have not read anywhere that glass is not suitable for rimless, you just know it is a fragile material and not a good idea as it is likely to fail. This is the same problem with some of the newer indices available, but because they are made out of a monomer and are similar in concept/design (type of plastic) it is not unreasonable to assume they all have the same properties. They do not.

Over the past 30 years we have seen a plethora of new materials come on the market 1.5, 1.53, 1.56, 1.6, 1.67, 1.71 and 1.74, but as I have found, information on how and when to use these materials and what mounts they are suitable for is in short supply. In fact, it is surprising how little information I can obtain on tensile and flexural strength for each individual index. Some lens manufacturers are trying to address the issue by giving their own recommendations and guidelines in their price lists on lens suitability. Although I do not entirely agree with all of their recommendations, at least they recognise the problem and are trying to assist dispensing opticians in making an informed choice.

Rex Features

If the customer's lens breaks or her frame fails, she may think she has been given bad advice by the dispenser

Material tensile and flexural strength

It is not uncommon to believe that the higher the index, the stronger it is and therefore the more suitable it is for rimless and inline frames. This is not entirely accurate. To judge how suitable a material is to withstand the forces that lenses undergo in a rimless mount, we look at its tensile strength (how much a material can withstand while being stretched or pulled) and flexural strength (how well the material is able to resist deformation or bending). When this information is not available (and it is often not) we are left using our experience to determine which product is best suited and we try to advise our customers accordingly. Unfortunately this can result in conflicting information for the dispensing optician, with the lens supplier suggesting the product is okay and the independent manufacturing optician advising it is not.

In my experience dealing with different types of materials throughout the years, it has become clear to me which are the best and least suitable for rimless and inline mounts. I would like to take this opportunity to share my experience and give my advice on what I believe the most suitable indices are for rimless and inline frames, combining strength, clarity and mutual compatibility.

Within any given index, the tensile/flexural strength of a material can be affected by variables including the lens thickness, the monomer used for manufacture and the coatings that have been applied to the lens. This means that one brand of 1.6 (for instance) could be stronger than another; the same applies to all indices. Based on these values, Table 1 is a list of what I believe are the most suitable materials for rimless and inline frames (1 = most suitable to 8 = least suitable) based on their tensile/flexural strength and my experience using them.

TABLE 1

	Material	Abbe value	Tensile strength			Flexural strength	
			kgf	Psi	Mpa	psi	Mpa
1	1.53 (Trilogy)	45		N/A	N/A	N/A	N/A
2	1.67	32	67.30	15,080	104	23,055	159
3	1.6	42	80.50	14,355	99	20,445	141
4	1.59 (polycarbonate)	30	44.90	9,500	65.5	13,499	93
5	1.71	36	52.90	N/A	N/A	N/A	N/A
6	1.56	33	10.00	N/A	N/A	N/A	N/A
7	1.5 (CR39)	58	15.60	5,220	36	N/A	N/A
7	1.74	38	31.60	N/A	N/A	N/A	N/A

Tensile strength is stated in kilogram force, pounds per square inch and megapascals, flexural strength is stated in pounds per square inch and megapascals, N/A = not available

As you may have noticed in Table 1, there are a lot of gaps. As I have already mentioned, there is a huge lack of published information on lens strength and some of the information on tensile strength is conflicting as different methods are used to obtain the results. I have chosen to use two sets of figures, one published by Zeiss and the other an independent source, to use as a guide in Table 1.

I believe 1.53 is the most suitable material for rimless and inline frames. Although I cannot find any tensile strength information on 1.53, most companies [like ours] will offer a lifetime warrantee against breakage such is the confidence in the strength of this material. This guarantee and the fact 1.53 has one of the highest abbe values really does make this lens the perfect option for rimless.

Although we start to see a drop in the tensile strength with 1.6 and 1.67, these materials are still among the highest rated and therefore also extremely good for rimless and inline frames (although optically their abbe value is not as high as 1.53).

While polycarbonate offers strong impact resistance, its weakness is in its susceptibility to chemical attack, this, combined with a low abbe value is why I have only rated it in fourth place.

You will also notice that 1.74 is one of the weaker materials, being ranked joint seventh in my table. I placed 1.74 alongside 1.5 (CR39) because, although 1.74 is likely to have a stronger tensile strength than 1.5, I find it to be extremely brittle when flexed [more akin to glass] therefore much less forgiving than 1.5.

Summary

It surprises me that as an industry we have not addressed this issue. We have not even agreed a standard method of testing a lens for strength or agreed on a term in which to describe lens strength, let alone a guide to lens suitability.

It would be wrong of me to suggest never glaze 1.5 and 1.74 into a rimless mount; in certain circumstances it is unavoidable. For example, if you have a client with a high prescription and she wants the thinnest lenses possible, it is not unreasonable to prescribe 1.74. Also, if a client wants a rimless mount and cannot afford to upgrade into a higher index, do you refuse to sell her the frame she wants? Of course not.

All I am advising is for the dispensing optician to be aware of the potential problems your client may experience by unknowingly dispensing a lens into a frame that is not mutually compatible. If the intended frame or mount is ridged and unforgiving then think carefully about the lens type you recommend and try to avoid using 1.5 (CR39) or 1.74.

Once you have completed your rimless or inline dispense and recommended a lens type to your customer, I am sure you would not want to see her again with a problem with the spectacles you have supplied. It is worth remembering that from a customer's point of view, if her lens breaks or her frame fails, it is not only a broken product and the inconvenience that she has to deal with but she could also see it as having been given poor advice with the lens she had been recommended to buy.

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