Denture-base acrylcs on trial

Martyn Young, takes a closer look at the advances in denture based acrylic technology.

As a lab owner, I am invariably asked by manufacturers to test different products. I have always done this in a totally independent way, as I assume the manufacturer concerned will want a completely honest appraisal.

In the case of one manufacturer, Kemdent, I have always been able to openly discuss if I don't like the standard of a particular product, even if it purely comes down to disliking the colour or its handling characteristics. The testing of these specific materials and the advice I have provided to the manufacturer, has enabled both parties to work towards better products, hence advancing standards for the future of the industry.

Move towards private market
Because of the growing private market, coupled with higher patient expectations and the rise in fees, dental laboratories are under increasing pressure to produce better quality prosthetics. Therefore, when choosing materials for these private quality dentures, we naturally look to use high quality denture teeth together with a "High Impact" denture base acrylic, especially as these products are promoted for use to this marketplace.

Using the materials mentioned, in combination with the set up and gum contouring, combined with the techniques and extra quality, will in theory create a denture that offers greater strength, more accurate fit, better appearance and overall comfort for the patient.

With so many high impact denture base acrylcs on the market, how do we know which one to choose?

Explanation on how we choose which material to use
In my laboratory, we test and evaluate the different properties of the materials, bearing reference to what we consider to be the important features. Before we choose any denture base material, we find out as much technical information and test the material with real life cases.

The criteria we use for this evaluation is as follows:

- Strength of denture base - As high as possible is best. (Taken from Technical information provided)
- Amount of Residual monomer present when cured - As low as possible is best. (Taken from Technical information provided)
- Colour of the denture base - Is it a natural looking colour?
- The amount of time taken to cure. (Taken from Technical information provided)
- The time taken to reach dough stage.
- The time the dough remains workable.
- Cost of the denture base.
- Are there any other add on features i.e. warranty?
**Increasing performance issues**

For many years now, we have found it is difficult to acquire all the technical information we need to make these types of decisions. Obviously all manufacturers want to sell their materials and inform you of their best properties, but that is not always the complete picture.

For instance, one of my concerns is that we are encouraged to use high impact acrylics for private dentistry, without really knowing all the facts about the product, including the benefits and negatives of the material.

I have had some questions regarding these materials, because although they cost approximately 10 times as much as the standard denture base acrylics, I was still not sure as to whether we were achieving the full value for the extra money, or the quality in increased performance that was expected. Not forgetting that, in most people's minds, the price of the material must mean that it is far superior.

Of course, I know that the extra cost of the materials shouldn't really be a problem after all the laboratory should be able to price their products to take any increase within the material cost into account. However, I was still concerned that we were not necessarily producing a better product.

For one, it has been my experience that most dentures that break prematurely, and while in use, are mainly caused by a slight flexing of the denture in the mouth.

With this factor in mind, I could now determine what was required for my private cases. The result: a denture base acrylic that combined both the qualities of high impact strength with a high functional, flexural strength.

**High Impact Acrylics**

The high impact acrylics on the market seemed to sacrifice the flexural property in favour of high impact strength. This of course would not be a problem if you were only concerned with impacts. i.e. if they are dropped.

On this occasion, the manufacturer Kemdent came to me with their answer, **ACRON HI**. It introduced me to a product that could fulfil my criteria for a high quality acrylic. To this end, they supplied me with all the data used in this article together with independent tests by **Ineos Acrylics Newton Aycliffe Ltd**.

Graph 1 relates to the market leading High Impact Acrylics. It clearly shows that they have less flexural strength than some conventional standard denture base acrylics. However, the manufacturer’s new denture base acrylic has a similar if not slightly higher flexural modulus than the standard base, indicating true high impact status and extra flexural strength. These are some of the features I thought should be essential for a high quality denture base acrylic.

**GRAPH 1**

The fact that the leading brands sacrificed this flexural strength, in pursuit of high impact strength, I found especially interesting.

We therefore need to ask some questions regarding the constitution of these materials.

**Is the material much stronger than average? In fact, is it any stronger? How do we define stronger?**

**High Impact Strength**

The following graph (Graph 2) is the standard High Impact and Impact Strength test, which displays how much stronger these products are than their standard equivalent (again **ACRON HI** performed well.)

**GRAPH 2**
My laboratory has been using this manufacturer’s **Acron HI** denture base acrylic since we were first introduced to it a couple of years ago. After viewing trials and consideration of the data they provided, we started to use the product. Today, we use it exclusively for all our private and independent cases. Once again, the manufacturer states that this acrylic is a true high impact based product, with the additional qualities of their unique Multi Matrix technology. (Figure 1)

See diagram below: Figure 1

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**The proof**

Everything the manufacturer says about this product appears to be true. We now have the confidence in knowing, that by using this acrylic, we can produce the high quality products demanded of us with the consistency and control we desire.

Our laboratory uses this material in the conventional way (Flask and Pack) as well as with (“Dentsply Success”) an injection moulding system. Most technicians will probably be aware that there are several advantages to processing dentures using this or other injection systems.

**Firstly, there is a greater accuracy of the fit surface and the vertical dimension, mainly due to the closed flask employed in the process.**

**Secondly, there is also an increase in the density of the denture base material; this increase should also enhance the strength of the denture base.**

**The mixing process**

Another quality, which I believe to be essential for the cured denture base material, is the low residual monomer.

To some extent, we can control the levels of residual monomer in the cured denture.

Firstly, always ensure that the correct mixing ratios for the product are used. We always measure the monomer and the polymer as per instructions. This ensures that the initial monomer content in the mix (about 35%) of the mass being cured is at the optimum amount for the mix. The percentage of residual monomer can only come from this portion.

Also to achieve this quality, I would advocate a slow cure over night. We use a multi cure water bath, with a cycle of 7 hours at 75°C rising to Boiling point for the final 2 to 3 hours. By using this curing cycle, we are ensuring the minimum of residual monomer present in the cured denture, with less likelihood of an allergic reaction to the monomer. It also follows that, by allowing there to be more conversion of the monomer, there is likely to be more cross-linking. This will also maximise the strength of the material.

There are many acrylics on the market that can be cured in 20 minutes. Personally, I have always thought that to cure a denture, with a 20 minutes curing cycle, would surely produce an inferior product, especially in comparison to one that has a longer curing cycle. The graphs I have obtained from the manufacturer and have included below seem to bear witness to this assumption.

**Low Residual monomer content is preferable**

You have in your power, the ability to control to a lesser or greater extent, the amount of residual monomer in the finished denture:

- By following the mixing instructions;
- By selecting the correct product;
- Controlling your curing cycle; and
- Curing for an even longer period and at a higher temperature if possible.

Notice how, on the graph (Graph 3), all the levels of residual monomer have reduced after 6 Hours of curing.
Summary
It is inevitable that in the future, another great denture base acrylic will be produced by another manufacturer. Naturally, I’m sure that along the way, we will be involved with testing and developing the product(s) for the use in more dental laboratories up and down the country. Up until that point, we trust that the manufacturer referred to within this article, is going to continue to liaise with our laboratory over future testing and development.

Overall, we have found that this manufacturer’s products provide us with good value for money. This has been a particularly important factor when purchasing from suppliers, especially as quality control issues remain paramount to the successful running of a laboratory based operation. Moreover, it is our firm belief that by forging closer links with the profession, we will be able to create stronger products for the continued advancement of dentistry.

For further information regarding the Kemdent product range as discussed in this article, simply click onto www.kemdent.co.uk or contact the company on 01793 770 256 to speak to the manufacturer directly.