

# SIX-PART SERIES EXCERPTED

## NAIL STRUCTURE & PRODUCT CHEMISTRY

### METHYL METHACRYLATE – MMA

In the early 1970s nail technicians used monomer liquid and polymer powder obtained from local dentists or medical supply stores. Some became highly allergic to these dental products, mainly because they didn't avoid skin contact. The culprit was the monomer methyl methacrylate. Once it was determined that methyl methacrylate was the cause, the FDA confiscated certain MMA-containing nail products and warned against future use of this monomer.

In recent years MMA usage has increased and it's become one of the most controversial topics in the professional beauty industry.

Unfortunately, there are many myths and misunderstandings surrounding the use of this ingredient. Most nail techs have heard that they shouldn't use products containing this ingredient, but very few know why! Many believe that MMA is too toxic to use safely. This is untrue. Relatively speaking, MMA is not as toxic as some believe. In fact, for many years MMA has been safely implanted in the body as a bone repair cement. MMA is not a human cancer-causing agent, it is not absorbed through the nail plate, it is not dangerous to inhale in the salon environment and it does not cause brain tumors. All these are silly, irresponsible myths spread by people who don't understand the issues. Here's the truth! MMA is a safe monomer when used in the proper applications. Artificial nail products should not be based on MMA monomer as an ingredient. There are four main reasons that MMA monomer makes a poor ingredient for artificial nail products:

- MMA nail products do not adhere well to the nail plate. To make these products adhere, nail techs must shred the surface of the nail plate. This thins the nail plate and makes it weaker.
- MMA creates the hardest and most rigid nail enhancements, which makes them very difficult to break. When a nail enhancement gets jammed or caught, the overly filed and thinned natural nail plate will often break instead of the MMA enhancement, leading to serious nail damage.
- MMA is extremely difficult to remove. Since it will not dissolve in product removers, it is usually prised from the nail plate, creating still more damage. Since MMA products tend to discolour and become brittle, they must be removed more often than EMA-based products and the difficult removal process often causes a lot of nail damage.
- The FDA and most state boards of cosmetology say not to use it. This clearly is the most important reason. The FDA bases its prohibition on the large number of consumer complaints resulting from the use of MMA nail enhancements in the late 1970s, and it continues to maintain this position today.

For these reasons, many countries and states, as well as most professional nail associations, have taken a stance against the use of MMA liquid monomer as an ingredient in artificial nail liquids – not because MMA monomer is overly toxic, but because it is an unsuitable ingredient. MMA monomer is used around the world and has a long history of safe use in medical and

dental products. MMA monomer is fine for making bulletproof windows and shatterproof eyeglasses, but not artificial nails. That's the real problem with MMA monomer liquid. How can you tell if MMA-monomer-containing products are being used in the salon? Some have tried to devise test kits that could be used to spot MMA monomer usage in salons. Unfortunately, these tests are not accurate. The only way to determine if MMA monomer is being used is to perform expensive laboratory analysis, called GCMS testing. Only the monomer liquid can be tested, not the artificial nail enhancement or polymer powder. MMA is only a problem in monomer form. In places where MMA usage has been prohibited, these regulations only apply to MMA monomer in its liquid form. MMA monomer is fine when used to create nail polymer powders or PMMA. Even so, it is not possible to prove that MMA monomer is being used without spending hundreds of dollars for a laboratory test. However, one clue is that MMA-containing products have a different smell. The monomer smells slightly sweeter and stronger than traditional products.

### AVOIDING ALLERGIC REACTIONS

Allergic reactions occur in every facet of the professional salon industry. Nail, skin and hair services can all cause problems for sensitive clients. Fortunately, the vast majority of fingernail-related problems can be easily avoided if you understand how! Allergic reactions are caused by prolonged or repeated contact. Therefore, skin problems do not occur overnight. Artificial nail products are good examples of this. In general, it takes from four to six months (or longer) of repeated exposure before sensitive clients develop skin allergies. Nail techs are also at risk. Simply touching monomers doesn't cause skin sensitivities; usually months of improper handling must occur before sensitivities develop. For example, nail techs sometimes develop sensitivities between the thumb and pointer finger. Why? From constantly smoothing monomer soaked brushes with their fingers. Eventually the pads of the fingers become sore and inflamed. Touching the client's skin with any monomer liquid has the same effect. With each service during which skin contact occurs, the risk of allergy increases with sensitive clients. The problem is, you never know who they are until it's too late. For this reason, it is extremely important that you always leave a 1/8-inch (3 mm) margin between the product and the skin for every client. Never intentionally touch any nail enhancement product to the skin.

### MIXING POWDERS & LIQUIDS

Can liquids and powders from different manufacturers be used interchangeably? Monomer liquids work best when used with the correct polymer powder. Besides having different chemical compositions for different powders, manufacturers use different levels of initiator in their powder. Using a powder with the wrong level of initiator is like using the wrong mix ratio! If there is too little initiator, the enhancement may be weak and the risks of developing an allergic reaction

are greatly increased. Also, if there is too much initiator, then discoloration and brittleness become more likely. In short, you should always use the polymer powder that was designed for the monomer liquid of your choice and at the correct mix ratio. It is not very wise to work with a mismatched liquid and powder. The polymer powder must contain the right amount of initiator to ensure proper cure. Upset the delicate balance with too much initiator or too much catalyst and the client's enhancements may suffer. For example, unreacted monomer can remain trapped inside the enhancement and may soak through the nail plate and nail bed to cause a nail bed allergic reaction. The truth is, there is no such thing as a liquid monomer that works with any powder or vice versa.

### DAMAGE CONTROL

It's a common misconception that artificial nail products 'damage' or 'eat' the nail plate. Verify this for yourself by taking a small clipping of natural nail plate and placing it in a tightly capped bottle filled with monomer. You can keep this bottle at your station and show it to anyone who believes that monomers damage the nail plate. The same can be done with any of the products you use. None will damage the natural nail, including primers.

Nail products do not damage nails – nail techs damage nails! Improper application and improper product removal cause most of the nail damage seen in salons. These problems can usually be traced back to a lack of knowledge, understanding, and awareness. Injury and nail damage are easy to avoid, but not by blaming the products. If a client's nail plates or surrounding soft tissue are in bad shape, the nail tech may be to blame. It's your job as a nail professional to keep the entire nail unit as healthy as possible. The information presented in my revised book will make you better-educated than the best nail techs of the past. Use this knowledge and strive to be the best you can be. You'll find it is much easier in the long run and far more rewarding.

Excessive shrinkage causes lifting and bubbles. Pocket lifting under liquid/powder enhancements usually occurs on or near the centre or apex of the nail plate. As the nail enhancement product shrinks, internal stresses build up inside the enhancement. This is especially true if the nail tech uses a wet mix ratio. Just as a magnifying glass focuses sunlight into a small, intense spot of light, the curvature of the natural nail plate focuses the stress forces of shrinkage towards the apex. It is at the apex where these forces meet and collide. When these stress forces become excessive, the product can lose adhesion and separate from the natural nail. The result is a small, bubble-like void or pocket between the enhancement and natural nail, centred directly over the apex of the natural nail. The deeper the curvature of the nail, the more likely that a centre pocket lift will occur. But there is another, more important reason centre pocket lifting happens. Using too wet a mix ratio will greatly increase shrinkage. Changing from a wet ratio to a medium consistency will usually solve this type of problem. (See Figure 9-3.)

# FROM THE SECOND EDITION OF

## BY DOUG SCHOON PART 5

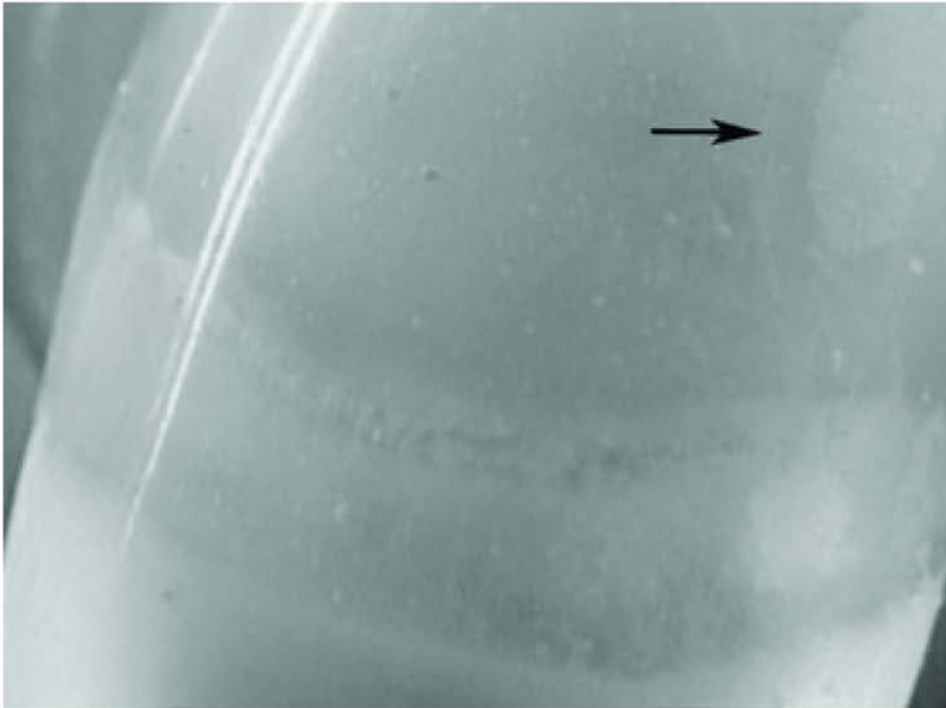


FIGURE 9-3 – IN THIS EXAMPLE, THE ARROW POINTS TO A VOID, OR LIFTED POCKET, UNDER THE ARTIFICIAL NAIL THAT WAS CAUSED BY THE UNDERCURING OF A UV ENHANCEMENT, BUT SIMILAR-LOOKING ROUND VOIDS CAN APPEAR AT THE APEX OF THE NAIL WITH LIQUID/POWDER SYSTEMS

Bubbles and voids can also be caused by excessive shrinkage, especially if the bubbles appear after the product has hardened. Voids are large, irregularly shaped bubbles that appear almost anywhere on the nail plate. They look very much like centre pocket lifting except for their irregular shapes. Voids usually form under UV gel enhancements that are not exposed to enough UV light and have undercured. Of course, excessive curing can also be a problem. Very tiny, nearly invisible bubbles always occur inside the artificial nail. In most cases, these bubbles remain unnoticed unless viewed under a microscope. But when shrinkage becomes excessive, these bubbles can expand and become visible. When tiny bubbles appear, only after the product has hardened, this is a sign that the mix ratio is too wet. In general, the wetter the mix ratio, the greater the shrinkage.

Figure 9-4 shows a highly magnified portion of the artificial nail before cure. Figure 9-5 shows the same portion of the artificial nail after the product has set up and turned hard. As seen in this figure, bubbles can grow to very large sizes when the mix ratio is too wet. The best way to prevent problems like this is to avoid using overly wet ratios of liquid monomer to polymer powder, no matter which artificial nail enhancement product you're using.

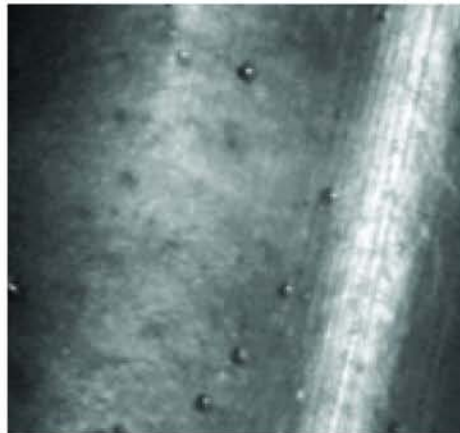


FIGURE 9-4

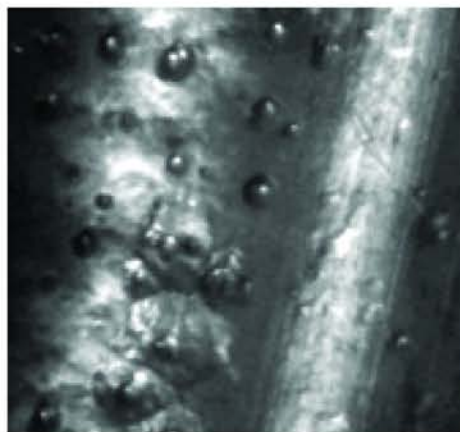


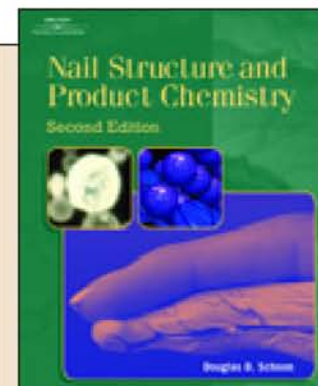
FIGURE 9-5

FIGURE 9-4 & FIGURE 9-5 – VERY TINY, NEARLY INVISIBLE BUBBLES CAN GROW IN SIZE AFTER CURING WHEN THE IMPROPER RATIO OF LIQUID AND POWDER IS USED



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Doug Schoon has over 30 years of scientific experience, a Master's degree in Organic Chemistry and is considered to be the leading research scientist in his field. His unique expertise focuses on the science of both the natural and artificial nail. He is a well-known and respected author, as well as an internationally renowned lecturer and educator. Mr Schoon is a strong advocate for salon safety. As co-chair of the Nail Manufacturers Council, he frequently represents the entire nail industry on scientific and technical issues in Europe, Canada and the USA and is often called to serve as an expert witness in legal cases involving cosmetic safety and health. Additionally, dermatologists frequently call Mr Schoon to assist in writing books and scientific papers concerning fingernails. For the last 16 years he has led the scientific research team for Creative Nail Design, Inc. and presently serves as its vice president of Science and Technology. He currently resides in Dana Point, California.



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