Harry F. Bader

Reducing toxicity in latex products

I am a regular reader of your column in *Rubber Asia*. It is very useful as it deals with commonly encountered problems. In this context, I think you are familiar with various leaching methods to remove residual chemicals.

I am doing research to reduce the toxicity from latex products. I want to do the leaching process so as to remove maximum residual chemicals. Distilled water alone is not that effective. Is it possible to use ammonia water and a slightly acidic medium to remove the maximum amount of residuals? Will they affect the mechanical properties of the latex films?

Elizabeth Abraham

Leaching requires consideration of four factors.

1. Temperature (hotter is better); 2. Fresh water flow (more is better); 3. Turbulence (more is better); and. 4. Time (more is better).

For a medical exam glove, I recommend the following as a starting point:

1.Temperature (no less than 65°C); 2. Flow (1 litre/100 gm of gloves — reverse to line direction); 3. Turbulence (enough so that the tank bottom is not visible); and, 4. Time (no less than 15 minutes). If these four are at the proper level. potable water is sufficient. Distilled water is an unnecessary expense.

Ammonia water in an acidic medium doesn't work because the ammonia will react with the acid and be of no value. However, a basic leaching medium does work. Ammonia is not a good choice because it is volatile. Turbulence and elevated temperature will drive it out of the solution.

A good, fairly cheap alkaline material is soda ash. It is not affected by heat or turbulence. Also soda ash is not a dangerous material. A 20% soda ash (Na_2CO_3) solution at 70°C with home washing machine turbulence for half an hour gives excellent results.

You used the term 'toxicity'. What are you referring to? Proper leaching will remove NR proteins and residual compound chemicals. However, if the rinse water contains endotoxins, the product won't be suitable for use. What is your measure of toxicity?

Get back to me if the above requires further explanation.

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We have been manufacturing condoms for more than 10 years. How do we put in place a general programme of improving our competitive position in the marketplace?

Anonymous by request

What is the nature of the problem? I believe that should be clearly defined before changes are made. For example: Is your problem marketing-related? Do you need a new name? A new package? A new slogan? More spectacular advertising? Colours?

Or is it quality-related? Do your condoms tear too easily? Are they difficult to put on? Does the lubricant discolour or smell bad? Are holes a problem? Are the condoms sometimes too short, or too

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long? Do the packages leak? Or, is your manufacturing cost too high? What is the reject level? For what defects?

There are solutions to all these. But, before you start making changes, which often can be very expensive, define your problems and your goals. This will help you design a plan for success.

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The following question is in response to my answer to a query which appeared in the Jan/Feb 2003 issue of RA. Since it is quite lengthy I'll respond separately to each issue raised:

We make zinc-oxide active (ZnO-AT) with the brand name Zincosil. We've over 10 years' experience in fundamental and application-oriented R&D of ZnO-AT. We've gone through your advice in the Jan-Feb issue, and would like to bring the following points to your notice:

Q. a. ZnO-AT doesn't necessarily have ZnO 69-74% only, as you mentioned. It can vary from 50 to 95% depending on the zinc compound that is being termed ZnO-AT. We make several proprietary zinc compounds (not necessarily zinc oxide by composition), which are better activators than White Seal, besides having other functional properties like 'reinforcement', which one cannot get significantly with White Seal compounding.

a-Answer

The question I received stated the specification for Zinc Oxide-Active (also termed zinc carbonate-basic) was 69-74% ZnO. There was no indication of higher percentages of ZnO. Also the term 'reinforcement' when applied to dry rubber is meaningful. But, it is alien to latex products. 'Reinforcement' of latex products means an increase of tensile strength. I've never encountered that except by the blending of another polymer with NR latex.

Q. b. Since the compound Zinco-sil itself is different from White-Seal, its specific gravity is lower. It is a simple fundamental of physics that specific gravity of a material does not change with size reduction. We are surprised at your claim that grinding White Seal dispersion will change the specific gravity.

b – Answer

My answer ("after grinding this changes") referred to the claimed advantages of lower specific gravity and density of ZnO-AT. After the White Seal is properly ground that advantage changes.

Q. c. Also the higher surface area is due to the porous nano-struct-ure of Zincosil and it won't cha- nge much on grinding. Also, by grinding, the surface area shall increase as may be predicted by simple fundamentals.

c - Answer

You are correct. ZnO-AT doesn't greatly change by grinding. However, the White-Seal will change greatly and, therefore, as a latex activator it will become more effective after grinding.

Q. d. White Seal is made by evaporative oxidation of zinc vapour. Lead is almost always present as an impurity in zinc metal, as lead has a higher melting point than zinc. White-Seal may have 20-5000 ppm of Pb, depending on the raw material, besides free zinc particles (unoxidized).

Since India has access to a lot of impure zinc dross and other forms of zinc metal from indigenous and foreign sources due to weak regulatory restrictions, the buyer can never be sure of how much lead and metallic zinc accompanies the oxide. We have done exhaustive survey of White-Seal samples from numerous sources and were surprised to see the high levels of contamination.

d – Answer

White Seal's lead as Pb specification is less than 0.02%. I would expect it to meet that or I would expect my ISO 9001 QC procedures to reject it. I'm not familiar with the brand. But, if it meets its specification it should be satisfactory for latex products. ■