Harry F. Bader

Can zinc oxide (active) replace 'white seal' grade in glove compounding?

We regularly go through your educative articles in *Rubber Asia*. Please let us know if zinc oxide-active (with specification enclosed) is likely to give any results in latex-natural compounding for gloves, latex thread and other products where French process zinc oxide (white seal) is used. It is said that smaller dosages of zinc oxide-active in place of the normally used white seal variety give better strength, physical appearance and colour reflection. In view of its (zinc oxide-active) higher surface area and very, very low other metal contents, how much reduced dosage could be given, because zinc oxide-active is costlier than the white seal grade? Your detailed guidelines will be appreciated.

Keralian Rubber Corporation

There are several factors to be considered before deciding whether zinc oxide-active (ZnO-AT) is a reasonable replacement for white-seal ZnO.

a) Zinc oxide (active) is 69-74% ZnO while white-seal ZnO is 99.85%.

b) Dispersions should be ground so that the particle size is 2 microns or less.

c) Sulphur is the most difficult to grind of the latex additives. ZnO is easy.

Considering these factors, I'm doubtful of the claimed advantages.

1. **Claim:** Specific gravity and apparent density of ZnO-AT are lower. **Fact:** After grinding, this changes.
2. **Claim:** The surface area is wider. **Fact:** Not after grinding.
3. **Claim:** It contains very few harmful impurities. **Fact:** Impurity levels in the white-seal grade are satisfactory.
4. **Claim:** As ZnO-AT is a finer particle, it is superior in its dispersion. **Fact:** Dispersing (grinding) the white seal grade is no problem.
5. **Claim:** Shortening of vulcanization time. **Fact:** How so? Accelerators and sulphur vulcanization times are not changed.
6. **Claim:** Generally, the consumption of zinc oxide (active) 'ZnO-AT' is about 60 to 80% of generally used WS in rubber depending on the compound. So ZnO-AT can save vulcanization cost. **Fact:** This must be established by experimentation.
7. **Claim:** The higher surface area imparts higher tensile modules and higher curing density. **Fact:** Too high a surface area needs more compounding time. After grinding, surface area differences are not an issue.
8. **Claim:** The finer particles increase the mechanical properties like tensile strength, tear strength, modulus and elastic behaviour even at lower doses

Harry F. Bader, Vice-President, Latex Services, Akron Rubber Development Laboratory, Akron, USA, and a world authority on latex, answers questions and doubts of readers on latex and latex products.

Send your questions to:

'The Latex Doctor'
Rubber Asia,
Dhanam House,
Cochin - 682 020,
Kerala, India
Fax: 94-484-317872

compared with normal WS of coarser particle size. **Fact:** After grinding, particle size is not an issue.

9. **Claim:** ZnO-AT, being very low in lead content, causes no discolouration; otherwise, it takes place due to the formation of black lead sulphide because of presence of sulphur in vulcanizates and hence can be used in light colour/ white colour articles of rubber. **Fact:** I've not seen this as a problem. What is the price differential, in any case?

In all cases, when a material is suggested as a replacement for one which you have been using for a long time, it is extremely important to proceed with caution. Trial batches should be made after successful laboratory experiments.

●●●

The coagulant solution on our glove line very quickly becomes contaminated with dirt particles, likely from the conveyor chain which holds the dipping formers. How can I solve this problem without frequently removing the tank for cleaning?

Anonymous

The first thing to do is more frequent chain cleaning. However, there are ways to remove particles from the coagulant.

In all cases, the coagulant should be agitated in some fashion to keep the solution from stratifying, and when a powder mould release is present, to keep it mixed. A circulating pump will provide that agitation.

For a clear coagulant, an in-line filter works well. The coagulant is always free from contaminants. However, for a coagulant containing powder, the circulating pump return line should pass through a #90 mesh cheesecloth bag tied over the end of the return pipe.

The cheesecloth will retain the dirt particles, but should allow the powder to pass through.

●●●

One of our customers requires a membrane which should resist to -65°C. In other words its glass transition temperature must be -65°C. My compound's Tg is -55°C. Is there a natural rubber which has lower Tg values than SMR?

Anonymous

There are two quick suggestions for the -65°C Tg.

1. If there are hydrocarbon oils in the compound, replace them with Ester oils such as DOA (di-octyl-adipate). Ashland Chemical is the supplier.
2. Add Polybutadiene Buna CB22, CB23, CB24, or CB25. These all have a Tg -109°C. CB25 is supposed to have the best "processability" with low temperature flexibility. Bayer Corpn. is the supplier.

Another possibility is synthetic polyisoprene. Goodyear Natsyn 2200 has a Tg -98°C.

Hope this helps. If not, ask them to submit a complete recipe for a recommendation.

●●●

Please let me know the specific test to assess the quality of constant-viscosity NR.

Sree Lakha

For latex, ASTM D 1076, and for dry rubber, ASTM D 1646.

Follow-up query from Sree Lakha: What are the quality control tests for dipped goods?

There are no specific requirements for QC testing. For both GMP and ISO 9001 Certifications, each manufacturer decides what controls are needed to ensure that his product meets the final specification.

In many cases, QC is merely checking process parameters on a regular basis to ensure all conditions are as they should be and the process is in control. This, plus certification of raw materials by the suppliers, results in high quality output.

Final product inspection will provide the verification of the above and will also provide the final quality assurance data. ■