Harry F. Bader

Resistance to air permeation — Water leakage

I made natural latex bladders, and I search for one natural latex mix with other latex or products for impermeabilization to the air for inflatable dipping products. Can you help me?

Victor Rodarte

Latex polymers other than natural rubber latex have superior resistance to air permeation. These include polychloro-prene, nitrile and butyl. These are generally not satisfactory as replacements for natural rubber latex because they do not have the same resilience. Sports ball bladders require a good "bounce". There is also the problem of increased cost.

An alternative to total replacement of the natural rubber latex is to apply an over dip of one of these polymers at a thickness which does not adversely affect the bounce.

I have made natural polychloroprene laminates in this fashion on a production basis, and experimentally with natural/nitrile and natural/butyl. The natural polychloroprene had a good service life and noticeably improves the resistance to air permeation.

Laminar fillers such as mica will also improve resistance to air permeation. Use a slurry rather than a dispersion, since ball mill grinding reduces the flake size and destroys the permeation resistance.

Some development work is required to get the proper recipes and the proper process.

I am engaged in an independent research project. I want to know whether a virus can penetrate through latex pores. I need any available information that you could give me on testing that your company has done; particularly the watertight leakage test.

Joshua

There are a number of specifications which apply to freedom from holes (water leakage) for both condoms and medical gloves. These are "copyrighted" so I cannot provide them to you. However, they are readily available from the library.

Gloves

ASTM D 3577 Surgeon's Glove Specifications

ASTM D 3578 Examination Glove Specifications

ASTM D 5151 Water Leakage Test Method

ISO 10282 Surgeon's Gloves

ISO 11193 Examination Gloves

FDA CFR 21 Part 800 Surgeon's and Examination Gloves

Condoms

ASTM D 3492 N.R.Latex Condom Specification

ISO 4074 N.R. Latex Condom Specification

FDA Guide 7124.21 Sampling for Water Leakage

Both

ASTM F 1671 Pathogen Penetration

Water leakage testing to meet all the above standards is performed by independent laboratories and by manufacturers of the products. It is generally accepted that the materials, natural and synthetic, used for condoms and medical gloves when formed

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into an intact film free of detectable water leakage holes, will not allow the penetration of HIV virus.

There are several semi-annual inter-laboratory trials which are conducted to measure the quality of the testing. The accuracy of the results is operator sensitive. As almost everything in this world, if done properly it is good. If not done properly, it's not good.

Regulatory agencies throughout the world are also doing testing. Through the cooperative efforts of the manufacturers and the regulatory agencies, the world's supply of both condoms and medical gloves is constantly improving.

The problem of increasing virus infections is not due to poor products, but rather due to failure to accept that protection.

We manufacture toy balloons. Sometimes we have high loss due to tears when removing the balloon from the dip form. We use a 6% powder in coagulant.

Powder is :

10% Calcium nitrate

40% Talc

50% Diatomaceous earth

How can tears be stopped ? Is a better coagulant needed ?

Anonymous

There could be many reasons why you are having a problem such as you have described. Following are some possibilities:

The pre-cure of your latex may be high and, therefore, the film will have a lower tear resistance.

The coagulant tank agitation may be poor and some of the powder is setting to the bottom. If so, your 6% powder would be much lower. This could give less mould release.

The level of your coagulant or your latex may be miss-matched. I would expect the latex to be a bit higher than the coagulant so a thin film start to the bead roll be made. If the film is too thick at the start the bead will be loose and will likely to be too large. Both can have a higher number of strip tears.

Both latex and coagulant levels might be too high, which would lead to having thick bead rolls and subsequently more strip tears.

I suggest two things to be done.

1. When things are running well and strip tear numbers are acceptable, check on the various process conditions: such as latex pre-cure level, latex viscosity, latex % TSE, latex temperature, latex and coagulant levels on forms, actual coagulant powder concentration at the dipping level, coagulant temperature, form temperatures at various points, bead roll thickness and position on the form, are forms clean? and what are oven temperatures?

If you can establish what conditions are when quality is good, this gives guidance toward correcting things when quality is bad.

2. In any case, stripping can be made easier by adding 2-3% polyethylene glycol to the coagulant. I suggest PEG 1450, which was melting point just under 50°C. This would be a solid at dipping temperature and a liquid at stripping temperature. As a liquid, it is a good lubricant. If your temperatures are higher you may want to use PEG 4600 or 8000.

In an air cargo condition, where temperatures drop below zero celsium, will this affect nitrile gloves ? Cause crack or anything or damage to nitrile gloves ?

Alliance

Reichhold Chemical Company (leading U.S. supplier of nitrile latex) says the polymer Tg (glass transition temperature) is -30°C. This is a common temperature in Canada in the winter and I would also expect it to be common in unheated cargo planes. However, I have no knowledge of actual temperatures.

Although the additives in a latex recipe would likely to raise the Tg somewhat, it wouldn't get to 0°C. I and the technical representative at Reichhold have never heard of cold cracking of nitrile gloves during air cargo transportation. Cold cracking analysis is a common test for rubber products. You may wish to check your gloves to determine that critical temperature. ■