Rubber Blooming

Technically Speaking

What is rubber bloom?

You may often ask “What is that white stuff on the surface of my O-ring? Or U-Cup?”

Most nitrile (NBR), highly saturated nitrile (H5N/HNBR) and neoprene (CR) rubber materials undergo a process called “blooming” when they are stored. “Bloom” is a milky dusting of dry powder on the surface of the rubber. Typically, this is caused by unused vulcanizing agent(s) migrating to the surface of the rubber part.

Will it affect my O-ring’s (or seal’s) function?

Bloom is entirely superficial. If the gray color is not acceptable, wash the rings in water or light mineral oil to remove it. Since blooming is entirely normal and does not affect the function of a rubber seal, it is not considered a defect. Likewise, it is not considered a contaminant in the rubber material.

Why are these chemical agents used in rubber?

One of the methods of friction reduction in a sealing compound is referred to as internal lubrication. Internally-lubricated compounds have a friction-reducing agent dispersed directly into their chemical structure. The lubricant is added when the elastomeric compound is initially mixed. Though the lubricant does alter the compound, the elastomer’s basic properties remain largely unchanged. An internally-lubricated nitrile is still nitrile; it is simply a special formulation designed to minimize friction. It may help to think of internal lubrication as the end result of a planned incompatibility. By design, the added friction-reducing agent will not be chemically compatible with the base elastomer. This conflict means that the agent will separate itself and “bloom” up to the O-ring’s surface. Continual blooming of the agent keeps the seal’s exterior coated with lubricant, making the O-ring slippery and less inclined to stick during start-up.

What chemical agents are used in rubber?

It is worth noting here that lubrication can be either organic or inorganic. Widely-used organic lubricants include amides (in both flake and pellet form), waxes, esters, powdered PTFE, and mineral oils. Inorganic agents include graphite – powdered and flaked, and MoS₂ (Molybdenum disulfide). Whether organic or inorganic, the lubricant in use must be compatible with system fluids to avoid leaching (removal) of the agent, which can lead to dangerous degrees of seal shrinkage. The lubricant must also be compatible with all adjacent surfaces to avoid structural damage.