

Technical Note:**Metal Deactivation:****Protection of Silane Cross-Linkable PEX tubing materials**

Polymers come into contact with a wide variety of metals in everyday use. Metals may be in mechanical contact with the plastic products, incorporated into plastic products, or in some cases, compounded into plastic materials. In the case of PEX tubing, contact with brass or copper alloy fittings is the main concern. The use of these fittings is standard for the installation of PEX plumbing systems.

The interaction between metals and polymers is very complex. It has been found that the main cause of aging and mechanical property degradation of polymers is thermo-oxidation degradation via hydro-peroxide groups. The decomposition of peroxides into free radicals leads to decomposition of the polymer material in a type of chain reaction.

Normally the degradation of peroxides into free radicals begins at temperatures greater than 120°C (248°F), but in the presence of catalytic metals such as iron and copper, this reaction will take place at room temperature.

This knowledge and practical experience with polyethylene insulated communications cable in the southern United States led to the adoption of the standard use of metal deactivation and antioxidant systems for polyethylene cable insulation in the United States in 1972.

Metal deactivators work by bonding available metal ions into a chemical complex, which will not allow the metal ions to come into contact with peroxides. This stops the catalysis of the peroxide formation of free radicals so that degradation of the polymer can be stopped altogether.

Based on this knowledge and extensive research, SILON has concluded that it is necessary to include metal deactivators in PEX used for plumbing systems. For many years, SILON catalyst master-batch formulations have included an effective metal deactivation (MD) additive to protect PEX tubing against polymer degradation.

For additional reference:

Gaechter, Dr. R. and Mueller, Dr. H., *Plastics Additives Handbook*, 5th Edition, Munich, Hanser Gardner Publications, 2001.

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