The Behavior of Cold-Curing Resin after Thermal and UV Radiation Exposures

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Abstract. Potting compounds are widely used in electrical engineering. One of the distinctive subgroups is the so-called cold-cure potting compounds. These potting compounds are mainly used for mechanical or photosensitive protection and are thus often exposed to extreme conditions due to their nature of use. The epoxy mixture was subjected to a separate degradation process of elevated temperature (180 °C) and UV-B radiation (peak at 302 nm, 3x20 W) for 500 h. Electrical (volume resistivity, space charge, relative permittivity, dielectric losses), mechanical (tensile strength) and optical (FTIR) methods were used to verify the degree of degradation. From the presented results it can be seen that in terms of volume resistivity there is only a minimal decrease in both cases. However, the change in dielectric behavior is evident in the relative permittivity and loss factor, especially after the glass transition temperature is exceeded in the case of thermally aged material. The different behavior is also observable in terms of space charge trapping and de-trapping. Mechanical tests showed a significant decrease in tensile strength for the thermally aged material (≥ 50 % decrease). There was also a negative change in the case of UV-B exposure, but not as pronounced (≥ 10 % decrease). The thermal oxidation and photooxidation were confirmed by presence of additional spectral bands at 1740 cm^{-1} and 1650 cm^{-1}, respectively. These phenomena also resulted in typical discoloration of the samples (temperature: browning, UV-B: yellowing) after the exposure.