

# A study on Degradation Mechanism and Prediction of the Life Period of Paint Films

November, 1990

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Typical paint films generally comprise various kinds of resins, hardners, and pigments. The degradation of the paint film has been considered to occur an electron transfer among these materials, water, and oxygen through radical formation under UV light. In this work, the degradation process and the prediction method of the life period of clear and enamel paint films have been studied by using an ESR spectrometer.

Some paramagnetic species were found in the paint films comprising combinations of an organic pigment and titanium dioxide. The combinations showed no hyperfine structure and their  $g$ -values drastically changed according to sample preparation and the measurement temperature. These paramagnetic species are supposed to be  $O_2^-$  and/or  $O^-$  in an adsorbed state on a  $TiO_2$  surface. It is suggested that film degradation occurs through an attack of these active oxygens on the organic pigment and the resins.

Phenoxyl radical is generated from bisphenol A type epoxy resin by UV-irradiation. It was investigated to see whether this type of epoxy resin was an effective radical trapping agent for resin films. By using epoxy resin as the radical trapping agent, it was clarified that the ESR method could be used to evaluate quickly the weather-ability of paint films and their raw materials, such as titanium dioxide, UV-absorbers and resin monomers, and to predict the life period of paint films.