allied academies

2nd International Conference on

Materials Science and Engineering

February 25-26, 2019 | Paris, France

The morphological evolution for composite urethane-based coating induced by photo-aging and the characterization of photo-product using FTIR-ATR and ToFSIMS

Takato Ishida and **Ryoma Kitagaki**
University of Tokyo, Japan

Durability is one of the most important aspects of industrial materials, and an organic-based coating is affected by outdoor conditions (e.g., ultraviolet (UV) light, heat (temperature), moisture (humidity)). Generally speaking, photodegradation is the most crucial for coating's weatherability, then, it also causes significant structural changes on exposure to UV irradiation, which causes deterioration in its physical and mechanical properties. Within degradation induced morphological changes, pore structure (including free volume) is well known as one of the most influential characteristics on macroscopic properties. Besides, regarding composite coatings (e.g., polymer matrix filled with titanium dioxide), they commonly have a layer concentrated low molecular weight component on the coating surface, this is called as 'clear layer'. The characteristics of such layer have a significant impact on surface properties. In heavily degraded case, the repairing by filling up coating binder component is one of the possible options for continuing using for degraded coatings, and then, we should choose the mending material based on the characteristics of the deteriorated coating surface. We have already found that the chemical character of surface layer should be changed depending on the degree of chain scission induced by UV irradiation, this might be because of the diffusion of low molecular weight photo-product toward the sample surface, driven by free energy gradient. Based on above consideration, in this paper, we will report the internal morphological change induced by photodegradation proved by solvent swelling behavior and the change of surface layer characteristics by using FTIR-ATR (Fourier transform infrared spectroscopy attenuated total reflection) and ToFSIMS (Time-of-Flight Secondary Ion Mass Spectrometry), moreover, their mechanisms will be discussed.

e: a0904ishida@gmail.com