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Understanding the Incipient Discharge Activity with Epoxy/MoS_2 Nanocomposites

P. NAGACHANDRIKA*, K. SRIDHARAN*, R. SARATHI* and Noboru YOSHIMURA**

*Department of Electrical Engineering, IIT Madras, Chennai 600 036, India
**Tohoku University of Community Service and Science, Yamagata 998-8580, JAPAN
E-mail:rsarathi@iitm.ac.in

In power apparatus, it is essential to have insulating material with high resistance to damages. MoS_2 nanofiller can provide good mechanical, insulating and thermal properties. An attempt has been made to understand the resistance to damage of the material through surface discharge studies and it has been observed that addition of low weight percentage of MoS_2 has high resistance to surface discharges. The results are aided by surface charge accumulation studies. Characteristic variation in dielectric properties of the material indicates that low weight percentage addition of MoS_2 nanofillers shows a reduction in permittivity of the material and has low loss. It was observed that epoxy nanocomposites are resistant to water droplet initiated discharges. Corona inception voltage (CIV) with multiple droplets, droplet near high voltage and ground electrode were measured. It is interesting to note that, irrespective of the number or the position of water droplets and voltage profile, 0.5 wt% MoS_2 added epoxy shows high resistance to discharges. It was also observed that CIV reduces when two droplets placed in electrode gap and when the droplet is placed near the electrodes. Glass transition temperature (T_g) of epoxy/MoS_2 varies with filler loading. Optical emission spectroscopy (OES) results indicate that the plasma temperature is low for epoxy resin with 0.5 wt% MoS_2.

Keywords : Nanocomposite, surface discharge, MoS_2, surface roughness, surface charge accumulation, epoxy resin