전기장 분산기술을 이용한 에폭시 마이크로-나노 입자가 혼합된 콤포지트의 전기적 그리고 기계적특성

Electrical and Mechanical Properties for Micro-and-Nano Mixture Composites using Electric Field Dispersion Technique

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Abstract : A epoxy/multilayered silicate nanocomposite was prepared by a new AC electric application method and micro silica particle was poured into the nanocomposite in order to prepare epoxy/micro-and-nano- mixed composites (EMNC). Electric insulation breakdown strength was measured in a sphere-sphere electrode system designed for the prevention of edge breakdown and the data were estimated by Weibull plot. As the exfoliated silicate nano-plates were homogeniously dispersed in the micro silica particles, the insulation property was higher.

Key Words :

1. 서 론

In particular, epoxy resins are applied to dry mold transformers and power CT/PT. Also, solid insulated switchgear(SIS) and gas insulated switchgear(GIS) require a large insulation spacer in order to support internal conductors. In general, it is essential for heavy apparatus systems as not only electric rotating machineries but static mold machineries. The epoxy resin is to be filled by certain micro scaled fillers (silica or alumina) in order to obtain low thermal expansion using some conductors, such as aluminum or copper [2]. The conventional filled epoxy that has low thermal expansion avoids the exfoliation between conductors caused by some thermal cycles or epoxy casting sections. In addition, it is required due to the heat generated during the operation of heavy apparatuses. The mechanical and electric properties of insulation materials at high temperature (about 100'C) determine the performance of these apparatuses and that assure a step further in the realization of environmental friendly heavy apparatuses by using it to solid insulation systems without using SF6 gas [3].

2. 결과 및 토의

In this paper, an epoxy/multilayered silicate nanocomposite was prepared by AC electric application method. In order to develop a new electrical insulation material for heavy electric equipments (mold-type transformers and CT/PT), epoxy/micro-and-nano-mixed composites (EMNC) with different mixture ratio were also prepared by various electric field strength and the electric insulation breakdown strength was tested.

1. As the electric field strength increased in the mixing process, glass transition temperature increased, which meant the fully exfoliated silicate plates disturbed the motion of the epoxy chains.
2. Short time insulation breakdown test was carried out in the sphere-plate electrode system designed for the prevention of edge breakdown, and the data were estimated by Weibull plot. The shape and scale parameters increased with increasing electric field strength, which meant the higher electric field strength, the better distribution of the exfoliated silicate plates resulting the higher electric insulation breakdown strength.

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