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The Influence of Epoxy Encapsulation on the Lifetime of High Voltage Ceramic Capacitors

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The lifetime of high voltage ceramic capacitors (HVCC) are always shorted because of suffering from circularly electrical, thermal and mechanical stresses, electric field concentrations and high current density. The reasons shall be analyzed and measures should be taken to prolong the lifetime of HVCC.
In this paper, a repetitive frequency testing platform was setup to study the influence of thickness and toughness of epoxy encapsulation on lifetime of HVCC under repetitive pulses. The results showed that the samples whose thickness of epoxy encapsulation is 8.5mm own far more lifetime than the ones whose thickness are 13.5mm and 6mm under 25Hz repetitive pulses. What's more, the samples with the epoxy encapsulation toughened by agent EHTPB have the lower deterioration rate of parameters such as capacitance, dielectric loss and insulation resistance.
Most of samples failed at the interface between ceramic and epoxy encapsulation. Besides the reason of concentrated electric field at the edge of electrodes, HVCC bear the circularly impact pressure and tensile stress during the repetitive charge and discharge process, resulting in mechanical fatigues at the interface between ceramic and epoxy encapsulation. Therefore, appropriate thickness and toughness of epoxy encapsulation could deterrent the mechanical fatigue at the interface and prolong the lifetime of HVCC.

Author: YAN, Jiaqi (Xi'an Jiaotong University)

Co-authors: CHENG, Le (Xi'an Jiaotong University); Prof. DING, Weidong (Xi'an Jiaotong University); Dr HAN, Ruoyu (Xi'an Jiaotong University); Mr WANG, Yanan (Xi'an Jiaotong University)

Presenter: Dr HAN, Ruoyu (Xi'an Jiaotong University)

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