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**Effects of 2D Boron Nitride (BN) nanoplates filler on the thermal, electrical, mechanical and dielectric properties of high temperature vulcanized silicone rubber for composite insulators**

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### Abstract

Degradation of the silicone rubber in the composite insulators is usually caused by thermal and electrical stressing. The thermal conductivity of the composite insulator can be improved by adding a second phase with high thermal conductivity. Boron nitride is a new kind of two-dimensional (2D) materials, with a microstructure similar to the popular graphene but electrically insulating. Such unique properties make BN a promising candidate for increasing the thermal conductivity while maintaining the electrical insulating properties of the silicone rubber. In this report, we systematically studied the effects of BN nanoplates as a filler on the thermal diffusivity/conductivity, electrical breakdown strength, mechanical performance, dielectric behavior, as well as hydrophobicity properties of high temperature vulcanized silicone rubber. A series of samples were prepared with different BN filler loadings up to 32wt% (~ 25vol%). We found that after adding BN nanoplates the sample's thermal conductivity can be increased by 30%. Surprisingly the electrical breakdown strength and hydrophobicity were also improved by the BN filler.

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