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## Ligand engineering for advanced polymer nanodielectrics

The combination of inorganic nanoparticles and polymer dielectrics leads to the formation of polymer nanodielectrics that can take full advantages of each kind of the materials, the understanding of which between nano-scale structure and macroscale electrical property, however, remains in its infancy. One of the critical knobs to tailor and optimize the performance of polymer nanodielectrics is ligand engineering to control and enhance interface properties, which is an effective way for the preparation of multi-functional polymer nanodielectrics with substantial improvements. The challenge is, understanding the influence of ligand engineering on the property of interfacial environment, which occupy a large proportion of the volume of polymer matrix and hence, can play a significant role in controlling over the macroscopic electrical property of polymer nanodielectrics. This reviews the recent literature on ligand engineering for tunable polymer nanodielectrics and highlights the fundamental challenges. In particular, we demonstrate the possibility of application of two typical surface grafting approaches, i.e. grafting to and grafting from, in high-molecule-weight polymer matrices via the successful fabrications of electrical-treeinhibiting PDMS-grafted TiO<sub>2</sub>/silicone rubber nanocomposites (in the voltage frequency range of 50 Hz-130 kHz) and spacecharge-inhibiting PSMA-grafted SiO<sub>2</sub>/cross-linked polyethylene nanocomposites (under the DC electric field of 30-100 kV/ mm) with low DC conductivity and high dielectric breakdown strength. This talk offers a general strategy to prepare polymerbrush-grafted nanoparticles especially compatible in high-molecule-weight polymer matrices, which opens the opportunity for the design of advanced polymer nanodielectrics.

## **Biography**

Ling Zhang is an Assistant Professor in the Department of Electrical Engineering, Tsinghua University, China. He has received his PhD and completed the Postdoctoral Research both from Tsinghua University. His research interests include nanoparticle-polymer interface, nanodielectrics, advanced PEA technology and space charge phenomena in solid dielectrics. He has published more than 35 papers in reputed journals and obtained 10 authorized patents. He is currently the Member of IEEE, IET and IAAM.

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