Study of Soy-Protein-Isolate and Its Nanocomposites for Electrical Energy

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Soy protein has been a renewable natural resource for bio-plastics, in the face of environmental concerns relating to production, application and disposal of petro-polymers. The proteins are known for their multilevel structures with complex asymmetry which suggests the possible spontaneous dielectric polarization in protein materials. It is believed that this structural asymmetry can be tuned via proper denaturation and modification of proteins. Thus, the protein materials are ideal candidates for new generation of dielectric films for capacitor applications. In this research, soy protein isolate, a high protein content soy product, has been investigated for the proposed green dielectric films. Via various denaturation and modification processes (i.e. temperature, pH, surfactants, etc.) applied to SPI, the relationships between structures and dielectric properties of SPI have been studied. Meanwhile, in order to improve dielectric performances of resulting SPI films, boron nitride nanomaterial has been incorporated to enhance the energy density.