Study on the thermal ageing performance and electrical properties of polypropylene blended polymers

X. Wang, T. Andritsch, I. Saeedi, O. Vryonis

The Tony Davies High Voltage laboratory
Electronics and Computer Science
University of Southampton
Southampton, SO14 1BJ, UK
*E-mail: xw11n20@soton.ac.uk

***Abstract*-- Polypropylene（PP） is a potential material to replace cross-linked polyethylene (XLPE) to become the next generation HVDC cable insulation. It has potential advantages in terms of its good insulation performance, high working temperature, chemical corrosion resistance and recyclability.On the other hand, PP is limited by its poor flexibility, low temperature brittleness and oxidation susceptibility. For this project, different types of blends of pure PP mixed with elastomers and antioxidants will be considered as research samples. Polymers' thermal ageing is closely related to their life assessment and application reliability under working conditions. Polypropylene has a potential operating temperature of 100-120 ℃, significantly higher than conventional XLPE. In practice,the presence of many unstable tertiary carbon atoms in the polypropylene chemical chain causes a continuous and complex reaction, resulting in a chemical change in the hardness of the polymer and hence its brittleness. Therefore, thermal ageing studies are essential for polypropylene polymers, reflecting both structural and physicochemical changes within the polymer. This project will focus on the accelerated thermal ageing of polypropylene blends in the lab, based on previous work on polyethylene systems. Subsequently, the chemical composition and physical structure changes will be assessed (e.g., melting, crystallization, etc.). Direct Current (DC) conductivity and space charge behaviors of samples after thermal ageing treatment in the presence of oxygen are also of interest. The project will further involve Fourier-transform Infrared spectroscopy (chemical structure), Differential Scanning Calorimetry (crystallinity), DC breakdown strength test, among other test methods. Aim of this project is to evaluate different polypropylene blends by analyzing and comparing these data.**