

Short communication

# High-temperature, polymer–graphite hybrid composites for bipolar plates: Effect of processing conditions on electrical properties

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## Abstract

High-temperature thermoplastic–graphite composites are prepared using polyphenylene sulfide (PPS) and polyether sulfone (PES) containing natural graphite powder. All samples are prepared by high pressure compaction and heating to high temperatures. The effect of a third additional conducting component on the electrical resistance of these composites is studied. A low resistance of the order of 0.1  $\Omega$  can be obtained even for a graphite concentration of 50% by addition of the third component. The effect of a mixing/blending technique on the anisotropy of conductivity is investigated. Solution blending of PES with graphite leads to lower anisotropy values than powder mixing and compression moulding. The samples when exposed continuously to a working temperature of 100 °C give a small but significant reduction in electrical resistance. X-ray diffraction studies on composites prepared by different techniques indicate that there is restructuring and crystallite re-orientation of the graphite phase in the samples. A large reduction in the crystallite size is observed for samples prepared by solution blending while re-orientation occurs after heat treatment. The changes in electrical properties can be correlated with these structural transformations in the composites.

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