Electro-rheological Properties of Polypyrrole prepared by the action of Mineral Acids on Pyrrole.

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ABSTRACT

The Electro-rheological (ER) effect, whereby the apparent viscosity of dispersions of polarizable particles in insulating oils may be markedly increased by the application of an electric field was first described by Winslow[1]. The possibility of rapid and reversible switching between the liquid and solid state has obvious commercial applications, such as in damping and clutch devices, and in robotics [2]. Many systems have been shown to be ER active; these have been extensively reviewed [3,4,5]. Most ER fluids require the presence of water to show appreciable activity, which limits their effective temperature range and can lead to corrosion problems. Recently it has been shown that semi-conducting organic polymers such as polyacenequinones [6], polyaniline [7] and poly(p-phenylene) [8] doped with copper chloride or ferric chloride exhibit ER responses in the anhydrous state.

We describe the syntheses of polypyrrole prepared by the polymerisation of pyrrole under strongly acidic conditions. Polypyrrole prepared using hydrochloric and hydrobromic acids, when finely ground and suspended in di-n-butylphthalate/1-bromonaphthalene was found to be ER active. Constant shear viscometry studies for electric fields of up to 600 Vmm^{-1} and different sample loadings indicate that this system has potential as a novel anhydrous ER system.

References

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