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Polysiloxane ionic liquids as good solvents for β-cyclodextrin-polydimethylsiloxane polyrotaxane structures

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Abstract

An ionic liquid based on polydimethylsiloxane with imidazolium salt brushes was synthesized as a good solvent for β-cyclodextrin-polydimethylsiloxane rotaxane. As expected the PDMS-Im/Br ionic liquid had a liquid-like non-Newtonian behavior with rheological parameters dependent on frequency and temperature. The addition of rotaxane to the ionic liquid strengthened the non-Newtonian character of the sample and a type of stable liquid-like network was formed due to the contribution of weak ionic interactions. The structure is stable in the 20 to 80 °C domain as proved by the oscillatory and rotational rheological tests.

Introduction

Ionic liquids (ILs) are environmentally friendly solvents with great potential for chemical and nonchemical applications due to their low melting points, nonvolatile and noncorrosive properties at room temperature. They possess good conductivities [1,2] and often they present a good thermal stability up to 400 °C [1,3]. The potential applications of ILs made them the subject of a number of works that showed their use as solvents or as solvents for synthesis and catalysis [4-6]. In this context ILs, which have polar and nonpolar regions, could play an important role in the field of supramolecular organization of different supramolecular structures (such as polyrotaxanes or supermolecules formed by ILs with different host molecules),