Effect of the number, position and length of alkyl chains on the physical and thermal properties of poly-substituted pyridinium ionic liquids

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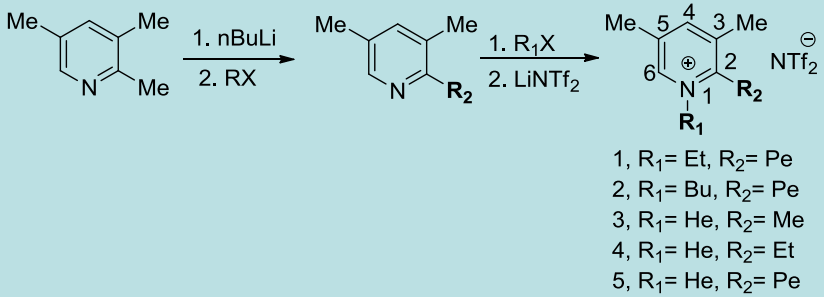
Abstract

In the last few years, ionic liquids (ILs) have been proposed as promising solvents for extractive desulfurization of fuels. The knowledge of their physical properties is of high importance in order to evaluate their potential applicability for this purpose. Recent studies have shown that ILs derived from pyridinium affords excellent S-compounds removal capacity.

Five ILs derived from pyridinium cation polysubstituted with different alkyl chains were synthesized. Their thermal properties (phase transition and decomposition temperatures) and physical properties (density, speed of sound, refractive index and viscosities) were evaluated. The analysis of thermal properties was carried out by Differencial Scanning Calorimetry (DSC) and Thermal Gravimetric Analysis (TGA).

The effect of the number of alkyl chains, their length and their position on the pyridinium ring over the studied physical and thermal properties is analyzed and discussed.



Scheme 1. Synthetic procedure and structures of the polyalkylpyridinium ILs studied in this work

Table 1. Thermal decomposition temperatures, T_{decom}, calculated by TGA and DSC for the studied ILs.

IL	T_{decom} TGA / (K)	T_{decom} DSC / (K)
1	641	640
2	638	648
3	643	663
4	630	639
5	637	625

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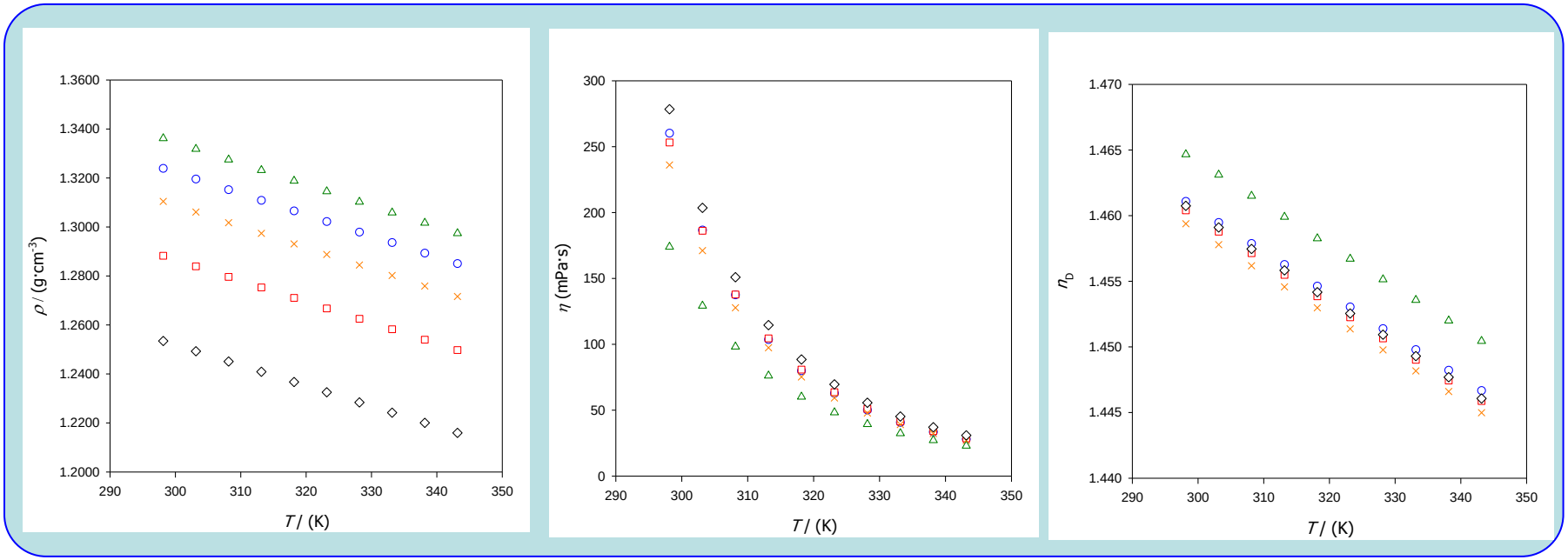

Figure 1. Temperature dependence of the physical properties of the studied ILs: a) density, b) dynamic viscosity and c) refractive index. Symbols: (○) $[^1E^3M^5M^2PPy][Nf_2]$ (**1**) ; (□) $[^1B^3M^5M^2PPy][NTf_2]$ (**2**); (△) $[^1H^2M^3M^5MPy][NTf_2]$ (**3**); (×) $[^2E^1H^3M^5MPy][NTf_2]$ (**4**), and (◇) $[^1H^3M^5M^2PPy][NTf_2]$ (**5**).

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