

Influence of hydrogen bonding network on the vibrational spectroscopic and dielectric properties of new imidazolium based ionic liquids

Mostefa BOUMEDIENE¹, Boumediene HADDAD^{1,2}, Redha OMEIRI¹ and Halima TAHI¹

¹. Department of Chemistry, Faculty of Sciences, University of Saida - Dr. Moulay Tahar- Algeria.

². LCMT, ENSICAEN, UMR 6507 CNRS, University of Caen, 6 bd Ml Juin, 14050 Caen

Corresponding Author: m.boumediene68@gmail.com

Abstract. Since about three decades ago, ionic liquids have been increasingly recognized as potentially useful materials in a wide field of applications. The recent years have seen a strongly growing research effort regarding these new materials. Currently, only a few Algerian laboratories are working on these compounds, most of them using conventional methods. In the present work, two new ionic liquids based on 1-buty-3-alkylimidazolium [$C_4C_nIm^+$] [X^-], (where n can take the values: 0 or 1) containing the chloride [Cl^-] anion were synthesized. The method is based on the alkylation reaction of 1-methyl-imidazole and imidazole as precursors. The obtained “ILs” are characterized by 1H -NMR, ^{13}C -NMR and FT-IR spectroscopy. Also, the influence of presence of the hydrogen bonding network between the both cations and the chloride anion are known to govern the molecular as well as physico-chemical properties. In particular, the cation-anion interactions were investigated in both ILs by means of NMR and IR measurements, with a particular attention to the occurrence of hydrogen bonding. Both techniques indicate that hydrogen bonding is stronger in the sample containing 1-butyylimidazolium chloride [C_4Im^+] [Cl^-]. Moreover, the preferred site for hydrogen bonding is the C (2) proton of the imidazolium ring; however, also the C (4)/C (5) and N---H protons of imidazolium ring participate to the hydrogen bonding.

Additionally, In order to decide whether these ionic liquid could be successfully used as electrolyte for electrochemical applications, the conductivity and dielectric relaxation properties of these “ILs” have been investigated according to the frequency at different temperatures.

Keywords: Ionic liquids - imidazolium - vibrational spectroscopy - dielectric properties.