SM-P004

Application of X-ray photoelectron spectroscopy (XPS) in ionic liquids

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Availability of X-ray photoelectron spectroscopy (XPS) for the identification of ionic liquids (ILs) was tested. Commercially available ionic liquids (1-butyl-3-methyl imidazolium tetrafluoroborate ([BMIM] BF_4), (1-butyl-3-methyl imidazolium trifluoromethanesulfonate ([BMIM] OTf), (1-butyl-3-methyl imidazolium hexafluorophosphate ([BMIM] PF_6), 1-hexyl-3-imidazolium hexafluorophosphate ([HMIM] PF_6), and 1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ([EMIM] Tf_2N) were qualitatively and semi-quantitatively analyzed with XPS. In order to confirm whether the results of XPS were correct, conventional method such as a nuclear magnetic resonance (NMR) was performed. After the XPS results were convinced by NMR, we synthesized ILs (1-(4-sulfonic acid) butyl-3-butylimidazolium trifluoromethanesulfonate ([SBBIM] OTf), 1-(4-sulfonic acid) propyl-3-methylimidazolium trifluoromethanesulfonate ([SPMIM] OTf), and 1-(4-sulfonic acid) propyl-3-butylimidazolium trifluoromethanesulfonate ([SPBIM] OTf) and analyzed it with XPS and NMR as well. It was successful the usage of XPS to analyze ILs without any purification processes.

Keywords: XPS, ionic liquid