

Evaluation of the Use of Ionic Liquids As Green Solvents for the Synthesis of Ibuprofen

Sargam J. Pawar, Prashant R. Pawar, Nitin N. Mali

Vidya Niketan College of Pharmacy, Lakhewadi, Pune, Maharashtra, India

sargampawar8@gmail.com

Abstract: *Ibuprofen (I) is the most widely used non-steroidal anti-inflammatory drugs (NSAIDs) has been synthesized in recent year. This study has comprehensively evaluated the utility of ionic liquids (ILs) as green solvents for the synthesis of ibuprofen, a widely used nonsteroidal anti-inflammatory drug (NSAID). The experiments were performed to evaluate the performance of different ionic liquids as solvents. A series of small-scale reactions were conducted under identical conditions, and the resulting yields and purities were recorded. A panel of six ILs was finalized: 1-butyl-3-methylimidazolium tetrafluoroborate ([BMIM][BF₄]), 1-hexyl-3-methylimidazolium hexafluorophosphate ([HMIM][PF₆]), N-butylpyridinium bis(trifluoromethylsulfonyl)imide ([BPyr][Tf₂N]), N-hexylpyridinium chloride ([HPyr][Cl]), tetrabutylammonium bromide ([TBAB]), and methyltrioctylammonium chloride ([MTOA][Cl]). Each IL represents a unique combination of cationic backbone and anionic counterpart, enabling comparative analysis of their performance in the ibuprofen synthesis. Purification was performed by column chromatography and recrystallization, and the compounds were characterized by infrared spectroscopy, nuclear magnetic resonance (NMR), and mass spectrometry. Advanced statistical analyses—including one-way ANOVA and multivariate regression—were applied to assess the influence of solvent systems on key synthesis. Result obtaining through systematic screening of five candidate ILs (IL-1 through IL-5), we identified IL-5 as the most promising medium, achieving yields of 92–95% under optimized conditions. To build upon the promising outcomes of this research, we outline several avenues for future investigation.*

Keywords: Ibuprofen, NSAID, ionic liquids, ANOVA

