

ORAL PRESENTATIONS

DESIGN OF FUNCTIONAL IMIDAZOLIUM IONIC LIQUIDS FOR BIOMEDICAL AND ENVIRONMENTAL APPLICATIONS

N.S. Sucman¹, E.P. Stingaci¹, D.Y. Bilan¹, V.S. Pogrebnoi¹,
M. Neamtu², F.Z. Macaev¹

¹Laboratory of Organic Synthesis, Institute of Chemistry, Moldova State University,
Moldova

² Department of Exact and Natural Sciences Institute of Interdisciplinary Research
„Alexandru Ioan Cuza” University, Romania

Ionic liquids have emerged as versatile functional materials with applications ranging from medicinal chemistry to environmental technologies. In this work, we present two classes of imidazolium-based ionic liquids developed using a common molecular design strategy based on the quaternization reaction, in which N-substituted imidazoles react with various halogen-containing compounds to afford imidazolium salts (Fig. 1).

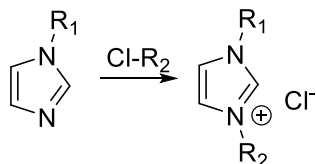


Figure 1

The first part of the study focuses on ionic liquids derived from natural steroid scaffolds. Novel steroidal imidazolium salts were synthesized and evaluated for their antiproliferative activity against nine cancer cell lines. Several compounds demonstrated pronounced anticancer activity, with IC₅₀ values as low as 1.5 μM, while the most active derivative exhibited selective cytotoxicity toward tumor cells with minimal effects on normal peripheral blood mononuclear cells, highlighting the potential of steroid-based ionic liquids as promising therapeutic candidates.

The second part describes the development of iron-containing imidazolium ionic liquids incorporating tetrachloridoferrate(III) anions. The synthesized tetrachloridoferrate(III)-based imidazolium salts demonstrated selective cytotoxicity toward the LN229 glioblastoma cell line, with IC₅₀ values ranging from 1.05 to 3.40 μM, comparable to that of the reference drug etoposide. In addition, these materials efficiently generate reactive oxygen species upon light irradiation and can be employed as photo-Fenton catalysts for the degradation of pharmaceutical pollutants in water.

So, these results demonstrate that the quaternization of N-substituted imidazoles represents a versatile synthetic platform for the development of multifunctional ionic liquids with applications in both biomedicine and environmental remediation.

Acknowledgements: The authors are grateful for the funding of this Research Project the the Romanian Ministry of Education and Research, CNCS -UEFISCDI, project number PN-IV-PCB-RO-MD-2024-0011, within PNCDI IV.

Keywords: imidazolium salts; steroid derivatives; tetrachloridoferrate(III); reactive oxygen species; anticancer agents