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Synthesis, Characterization and Antimicrobial Properties of Methylbenzyl and Nitrobenzyl Containing Imidazolium-Based Silver N-Heterocyclic Carbenes

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Abstract

A series of imidazolium-based novel ionic liquids (ILs) containing methylbenzyl and nitrobenzyl substituents were prepared and further converted to neutral as well as ionic silver complexes. The ILs and their Ag-NHCs (N-Heterocyclic Carbenes) were successfully characterized by NMR, FT-IR, and EI-MS studies. The ILs and Ag-NHCs were screened for antimicrobial activity based on the zone of inhibition, Minimum Inhibitory Concentration (MIC) determination, and stability studies against *Salmonella enterica* and *Staphylococcus aureus*. The neutral complex **NS-32** ((1-((2'-cyano-[1,1'-biphenyl]-4-yl)methyl)-3-(4-nitrobenzyl)-2,3-dihydroimidazol-2-yl)silver bromide) was the most active with MIC of 25 μ M and showed efficient growth inhibition of bacterial pathogens even up to 21 d. The complex **NS-32** was further monitored for cell wall disruption by scanning electron microscopy (SEM). The photomicrographs of bacterial cells obtained by SEM after treatment of **NS-32** with *S. enterica* and *S. aureus* showed rupture of a cell wall, thus proving it to be the site of action and ultimately having inhibitory effects on the microbial cell growth.

Keywords

Antimicrobial, Cell wall distortion, Minimum inhibitory concentration, N-heterocyclic carbenes, Silver

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