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Easily Vaporizable Ionic Liquids - No Contradiction!

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Abstract

Copyright © 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim. It was a big surprise to see crystals of an ionic liquid (IL) forming by sublimation at room temperature. ILs are generally accepted to have negligible vapour pressures at elevated temperatures, making their sublimation or distillation very difficult. ILs that sublime easily contain silylimidazolium-based cations. In order to establish the details of the unusual behaviour of this subclass of ILs, a combined spectroscopic, X-ray crystallographic, physicochemical and theoretical characterization was performed. The results are compared with those of other easily vaporizable compounds, like ammonium chloride and naphthalene. The single-crystal X-ray structure analysis of one of these compounds, N-methyl-N′-dimethyl(phenyl)silylimidazolium chloride (monoclinic, C2/c), clearly shows the existence of isolated ions, demonstrating that the compound is an ionic liquid. Ionic liquids (ILs) are commonly known as compounds with negligible vapour pressure, which makes them difficult to boil/distil or sublime. Surprisingly, ILs with imidazolium-based cations with the specialty of N-bonded silylorganic groups sublime very easily. The process of sublimation has been investigated thoroughly with physicochemical methods and theoretical calculations.

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Keywords

Boiling point, Ionic liquids, Silylimidazoles, Solid-state structures, Sublimation, Thermochemistry