Application of \(n\)-Dodecyltrimethylammonium Chloride for the Oxidation of Intermetallic Phases

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The thermal decomposition products of ionic liquids based on \(n\)-dodecyltrimethylammonium chloride (DTAC) were used for the preparation of the metastable allotrope \(\text{Ge(cF}136\text{)}\) by oxidation of \(\text{Na}_{12}\text{Ge}_{17}\) in gas-solid reactions. This method of preparation provides a promising low-temperature route for the synthesis of intermetallic phases and elemental modifications. In order to explore the reaction mechanism, we investigated the thermal decomposition of DTAC as well as of the ionic liquids DTAC/MgCl\(_2\) and DTAC/AlCl\(_3\) by \textit{in-situ} mass spectrometry and by powder X-ray diffraction. The results have revealed HCl, CH\(_3\)Cl and 1-chlorododecane to act as oxidizing agents in the gas-solid redox reactions.

\textit{Key words:} DTAC, Ionic Liquid, Oxidation, Ge(cF136), Ge(hR8)