A Simple High-Yield Synthesis of Gallium(I) Tetrachlorogallate(III) and the Reaction of Digallium Tetrachloride Tetrahydrofuran Solvate with 1,2-Diols

Eva S. Schmidt, Annette Schier, Norbert W. Mitzel, and Hubert Schmidbaur

Anorganisch-chemisches Institut, Technische Universität München,
Lichtenbergstrasse 4, D-85747 Garching, Germany

Reprint requests to Prof. Dr. H. Schmidbaur. E-mail: H.Schmidbaur@lrz.tum.de

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Gallium(I) tetrachlorogallate(III) $Ga[GaCl_4]$ was prepared in quantitative yield by thermal decomposition of dichlorogallane $[HGaCl_2]_2$, which is readily available from Et_3SiH and $[GaCl_3]_2$. The reaction of catechol with solutions of this gallium(I) tetrachlorogallate(III) in tetrahydrofuran leads to the evolution of hydrogen gas and affords a dinuclear gallium(III) complex with penta-coordinate metal atoms chelated and bridged by mono-deprotonated catechol ligands. In the crystalline phase tetrahydrofuran molecules are hydrogen-bonded to the hydroxy groups: $[Ga(1,2\text{-}OC_6H_4OH)Cl_2(C_4H_8O)]_2$. The reaction with pinacol also gives hydrogen and the analogous product $[Ga(OCMe_2CMe_2OH)Cl_2(C_4H_8O)]_2$. The structures of the two compounds have been determined by X-ray diffraction. A mechanism of the new reaction has been proposed which involves oxidative addition of the diol to the solvate $(THF)Cl_2Ga\text{-}GaCl_2(THF)$ present in the tetrahydrofuran solution to give a gallium hydride intermediate.