

High-Pressure Synthesis of a Gallium Oxonitride with a Spinel-Type Structure

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The new compound $\text{Ga}_{2.81}\text{O}_{3.57}\text{N}_{0.43}$ was crystallized under high-pressure / high-temperature conditions in a spinel-type structure from a prestructured gallium oxonitride ceramic, which was obtained from the single-source molecular precursor $[\text{Ga}(\text{O}^i\text{Bu})_2\text{NMe}_2]_2$ by thermal treatment in an ammonia atmosphere. The optimized precursor-derived gallium oxonitride ceramic remains nanocrystalline up to 600 °C and can be transformed at 7 GPa and 1100 °C into the crystalline phase $\text{Ga}_{2.81}\text{O}_{3.57}\text{N}_{0.43}$. The structure, homogeneity, and nitrogen to oxygen ratio were determined using TEM coupled with an electron energy loss spectrometer (EELS) and an energy dispersive X-ray (EDX) spectrometer. For phase analysis and structure confirmation, X-ray powder diffraction data were measured.

Key words: High-Pressure, Gallium Oxonitride, Spinel Structure Type