

A Systematic Investigation of the Stability Field of Spinel-type Gallium Oxonitrides

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Over the last years, the synthesis and characterization of new spinel-type gallium oxonitrides were in the focus of several working groups. Our systematic investigation of the formation of the gallium oxonitride spinel phases was done under different experimental conditions and with various educts already used in former studies. The experiments took place under high-pressure/high-temperature conditions in a multianvil apparatus, starting from the end members wurtzite-structured GaN and β -Ga₂O₃. Beside the variation of the molar ratio of the educts (w-GaN : β -Ga₂O₃ = 9 : 1 – 1 : 9), different pressures (1 – 11.5 GPa), temperatures (500 – 1350 °C), and heating protocols were studied to localize the formation area of the spinel-type gallium oxonitrides. From these results, initial conditions of 2.5 – 11.5 GPa at temperatures between 1000 – 1300 °C can be stated as leading to the formation of cubic, spinel-type gallium oxonitride phases. The temperature stability of the gallium oxonitride spinel phase as well as new results of the transformation of β -Ga₂O₃ into α -Ga₂O₃ are reported.

Key words: High-pressure Synthesis, Gallium Oxonitride, Spinel Structure, Gallium Oxide