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# High-Pressure Synthesis of Multifunctional Spinel in the Element System Ge-Ga-Cr-O-N

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The use of nitride semiconductors such as AlN, GaN and InN for (opto)electronic applications has become paramount in recent years. High-pressure-derived nitrides with direct band gap, e.g.  $\gamma$ -Ge<sub>3</sub>N<sub>4</sub> with spinel-type structure, are currently being explored. Similarly to already known ambient- and high pressure forms of the lighter group-4 nitride, Si<sub>3</sub>N<sub>4</sub> and its solid solutions with Al and O, e.g. Si<sub>3-x</sub>Al<sub>x</sub>O<sub>x</sub>N<sub>4-x</sub>,  $\gamma$ -Ge<sub>3</sub>N<sub>4</sub> could be modified by exchanging [Ge-N]<sup>+</sup> pairs with [Ga-O]<sup>+</sup> or even [Cr-O]<sup>+</sup> pairs to create novel solid solutions with spinel-type structure. Other oxynitrides containing Ga and/or Ge are already known to show promising photocatalytic properties for water-splitting. Moreover, the introduction of a magnetic ion into the spinel structure could result in novel materials with frustrated magnetism.

In this contribution, we present results on the synthesis and first characterization of spinel compounds in the quintary element system Ge-Ga-Cr-O-N and its ternary and quaternary subsystems.

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