

## Precursor-Chemistry for III-V-Semiconductor-Compounds

Harald Sussek, Jörg Schäfer, and Roland A. Fischer\*

ACI Universität Heidelberg, Im Neuenheimer Feld 270, D-69120 Heidelberg

\*Lehrstuhl für Anorganische Chemie II, Ruhr-Universität, D-44780 Bochum

Since the development of the first optoelectronic solid state devices about 25 years ago there has been a continuous demand for efficient blue and UV light emitting materials. The group-13 nitrides attract the interests of device applications with privileges of the wide direct band gap (1.9 eV InN; 3.45 eV GaN; 6.2 eV AlN), their isomorphous miscibility allowing band gap engineering as well as other materials properties including inertness, mechanical hardness and high thermal stability, radiation resistance, large avalanche breakdown fields and large high-field electron drift velocities.

Specially designed single source precursors show a lot of advantages: insensitivity to air (non-pyrophoric) and moisture, low poisonousness, a minimum of parasitic prereactions and simplified massflow (only one component), ideal vapor pressure (low) for MOCBE (metal organic molecular beam epitaxy), control of intrinsic impurities by ligand design and film processing by low temperatures.

Using the example of the actual single-source-precursor development for GaN and InN the future potential of single source precursor chemistry will be pointed out. The synthesis chemistry of intramolecularly donorstabilized Al, Ga and In azides is illustrated. The synthetic route to the precursors is classical HV-chemistry starting from metal halides, the appropriate ligand and sodium azide. The structures of the products were deduced from <sup>1</sup>H, <sup>13</sup>C NMR spectra and were confirmed by X-ray structural determinations. Films grown from these precursors are characterized by XRD, TEM and EDX.

Also precursor-decomposition-investigations of N<sub>3</sub>Ga[(CH<sub>2</sub>)<sub>3</sub>N(CH<sub>3</sub>)<sub>2</sub>]<sub>2</sub> on a sapphire-surface by QMS (quadrupole mass spectroscopy) and REMPI-TOF (resonance enhanced multi photon ionization - time of flight mass spectroscopy) in a special UHV-reactor under various conditions will be presented. H<sub>x</sub>Ga<sub>y</sub>N species were detected by molecular beam sampling as function of the substrate temperature.