

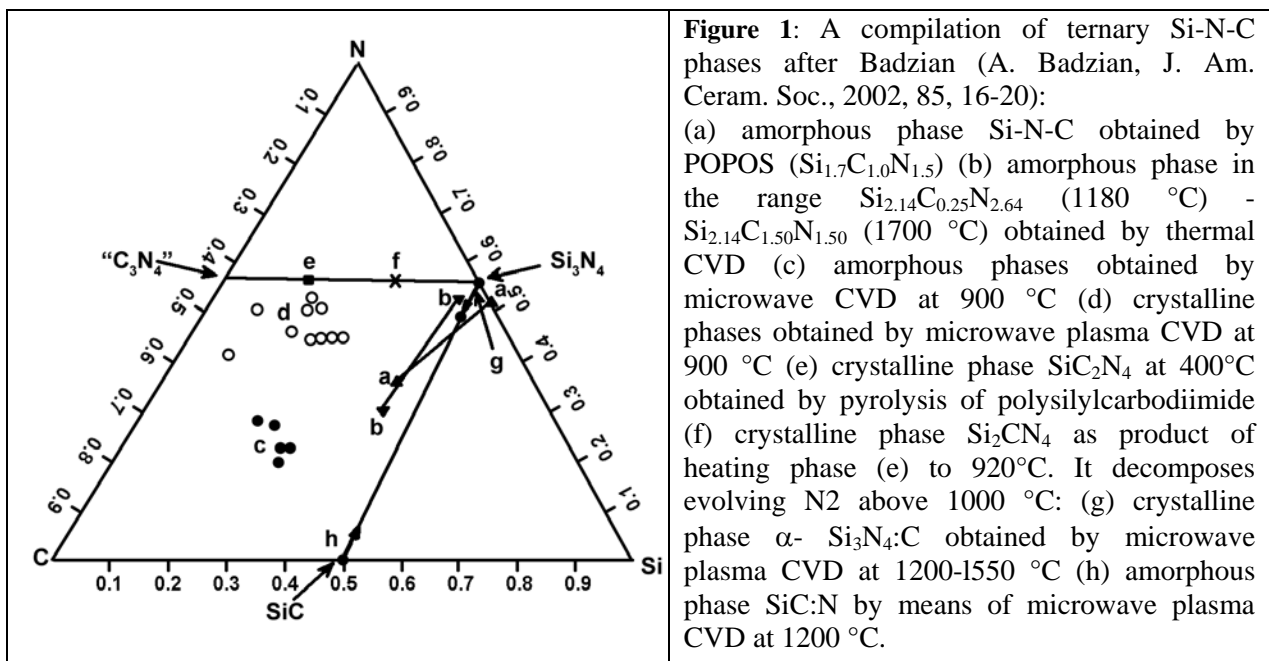
# High-Pressure Synthesis of Novel Binary and Ternary Superhard Phases in the Si–C–N System

R. Riedel, E. Horvath-Bordon, P. Kroll

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The scientific goals of the project are:

- (1) Synthesis of novel binary and ternary superhard phases in the Si-C-N system at high pressures and high temperatures.
- (2) Study of their physico-chemical, structural and bonding properties, the equations of state and phase stability, as well as mechanical and electronic properties



In the proposed research, the formation of novel binary and ternary superhard phases in the Si–C–N ternary system will be systematically examined under extreme conditions. In order to reach wide pressure and temperature ranges up to 50 GPa and 2000 °C we will use a laser heated diamond anvil cell (LH-DAC). The structures and properties of the samples will be analyzed *in situ* by synchrotron radiation, IR- and Raman spectroscopy and *ex situ* by powder X-ray diffraction, IR- and Raman spectroscopy, transmission electron microscopy and electron energy-loss spectroscopy. Moreover, by each step in the proposed project theoretical calculations will be performed in order to support the experimental development.