Nano-structured Materials of Covalently Bonded BCN Networks

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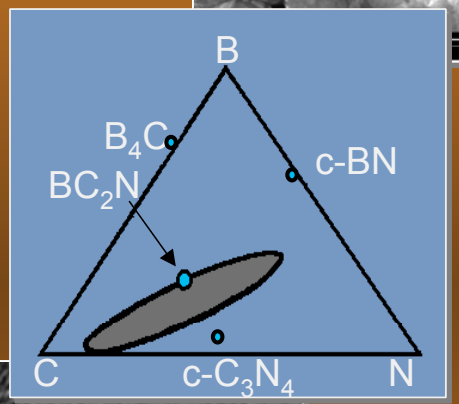
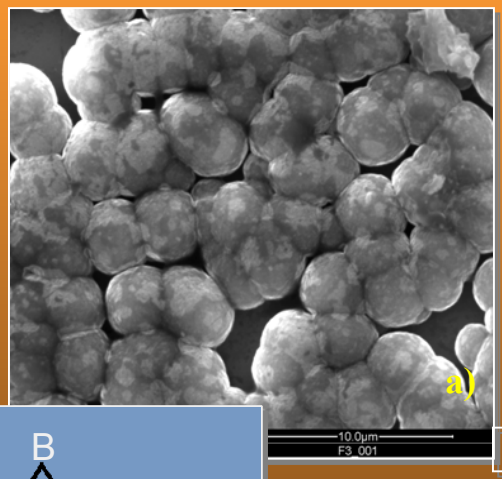
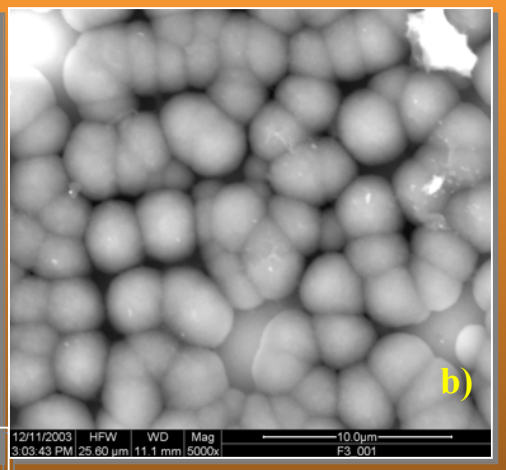
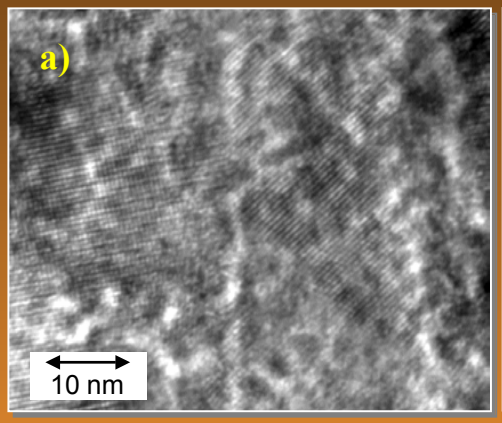
Carbon, nitrogen and boron-containing compounds are theorized to have hardness and toughness values potentially greater than those of diamond.

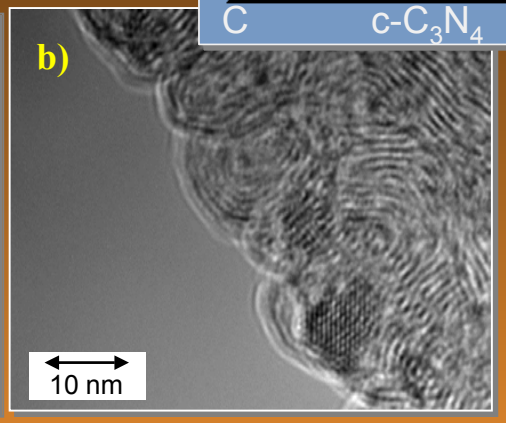






SEM images of N-doped diamond
(a) Secondary electron image
(b) Backscattered electron image





TEM images of microcrystalline diamond
(a) Microcrystalline region
(b) Turbostratic carbon region

Thin coatings of these new materials could be used in machining, electronics, MEMS, and protective coatings. The CSM group is collaborating with University of Cincinnati to characterize these thin films using electron microscopy techniques in order to understand the deposition process and to predict the structure of other compounds in the C-B-N system.

Outreach Work at Colorado School of Mines

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This research has fostered a cross-collaboration between graduate students at University of Cincinnati and Colorado School of Mines. At Mines, we have sent graduate students to conferences such as the American Ceramics Society annual symposium and the Gordon Research Conference, both to present posters and to oral presentations on their findings.

Graduate students, **Elanor Stellee** (left) and **Chris Moerbe** (right), have conducted several TEM specimen preparation tutorials for interested individuals at CSM, as well as teaching undergraduate level labs in SEM and TEM application. Throughout this research project, they were introduced to SEM and TEM imaging and electron diffraction techniques as well as to high-resolution TEM imaging employing a HRTEM intrument as shown in the above figure.