The Fate of Carbon in Polymer-Derived SiCO Ceramics

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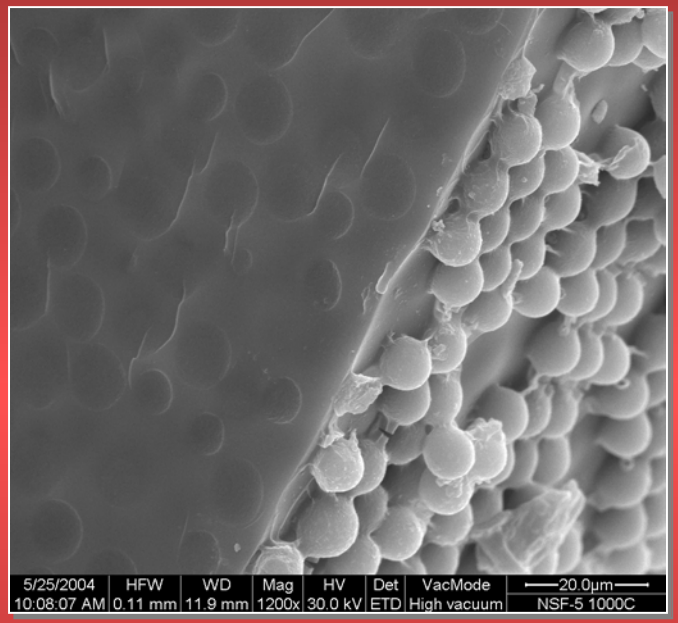
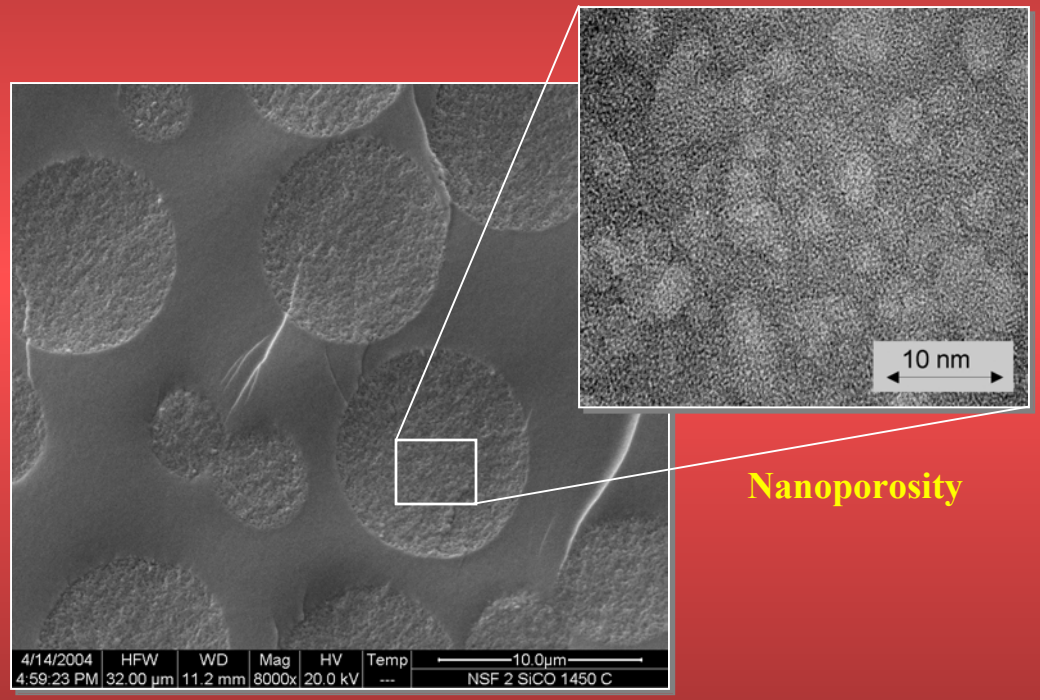
Polymer-derived ceramics reveal exceptional properties at elevated service temperatures such as high resistivity against crystallization and excellent oxidation resistance; in particular, when fabricated with a high content of excess carbon.



SEM image of a high-carbon content sample showing the porous elements embedded in the amorphous matrix.



Nanoporosity

SEM image of the fracture surface of a high-carbon content sample. The porous elements are also shown in the corresponding HRTEM image (right).

This research is close a collaboration between CSM and SRI International, Dr. Yigal Blum, who processed these exciting novel micro-structures.

Outreach Work at Colorado School of Mines

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The current research focuses on the effect of local nanoporosity introduced into these materials via a proprietary process (Dr. Yigal Blum) on the crystallization behavior of the system.
It is expected that nanosized porosity will strongly influence the crystallization of SiCO ceramics; i.e., increase the volume fraction of crystallites formed.

Throughout his research, our graduate student, **Steve Beccia**, was introduced to the various techniques of electron microscopy, including scanning (SEM) and transmission electron microscopy (TEM) in addition to analytical techniques such as energy-dispersive X-ray spectroscopy (EDS) and electron energy-loss spectroscopy (EELS). For his research project, however, electron diffraction and high-resolution TEM imaging is very important in order to characterize the excess carbon phase; Steve is currently introduced to both techniques.