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# Dense Carbon Organic Frameworks for Energy Storage

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The application of high pressure and high temperature can facilitate the formation of new chemical bonds between two grossly mismatched lattices or dissimilar chemical species in *solid states*. Furthermore, the properties of solids are, to a first approximation, controlled by the interatomic distance and arrangement (or structure), which can be tuned *precisely and substantially* by the pressure, analogous to the composition in molecular alloys. The expected properties of these extended alloys are, therefore, similar in their novelty to single-component low Z extended solids, yet they can be tuned chemically by varying the composition, adding chemical impurities, or using specific structural templates. These chemical concepts can be used to control the bonding, structure, stability, and properties of dense extended solids made from low Z elemental mixtures. In this paper, we will describe our recent research efforts aimed at the development of dense carbon-based low Z organic framework (deCOF) structures with unique superconducting, optical and chemical energy storage properties. The specific examples of deCOF materials to be discussed will include solid hydrogen intercalated graphite and carbon dioxide storage in porous nanodiamond.

## Biography:

Dr. Choong-Shik Yoo is Professor of Department of Chemistry, Institute for Shock Physics and Materials Science and Engineering at Washington State University. He received his PhD in Physical Chemistry in 1986 from UCLA and worked at Lawrence Livermore National Laboratory for twenty years prior to his current position at WSU. His research area of current interest is high-pressure materials chemistry to discover and develop carbon-based low dimensional structures, novel hybrid materials, high energy density materials, and superhard materials, utilizing diamond anvil cells, various laser spectroscopic methods, and novel X-ray diffraction and X-ray spectroscopy at third-generation synchrotron facilities.