David J. Green

Professor of Ceramic Science and Engineering

230 Steidle

814-863-2011

green@matse.psu.edu

http://www.ems.psu.edu/~green/djg.html

http://www.mri.psu.edu/directory/displayrecord/1234.asp

Biographical Sketch :

Professor Green received B. Sc. degrees in Chemistry and Materials Science from the University of Liverpool, England. He then pursued graduate study at McMaster University, Canada receiving M.Sc. and PhD degrees in Materials Science. Dr. Green joined the Canadian Federal Government to work in the Department of Energy, Mines and Resources and later moved to Rockwell International Science Center, California. In 1984, Dr. Green joined the faculty at Penn State as an Associate Professor and was promoted to Professor in 1991. Dr Green is a Fellow of the American Ceramic Society and the Canadian Ceramic Society and an Academician in the World Academy of Ceramics. Dr. Green is the Senior Editor for the Journal of The American Ceramic Society. In 2005, he was awarded the Sosman Award from the American Ceramic Society and in 2006 he became an Alexander von Humboldt Fellow, performing research at the Technical University in Darmstadt, Germany. Dr Green has published over 200 papers, including 2 books and holds 3 patents.

Research Interests:

Relationships between fabrication, microstructure and the properties of brittle materials; including:

- microcracking in ceramics
- reliability of ceramics in structural design
- failure analysis
- micromechanical theory
- fabrication and evaluation of transformation-toughened ceramics
- surface stresses
- toughening mechanisms

• indentation and fatigue of glasses
• mechanical behavior of porous ceramics.

Areas of research:

Dr. Green studies the relationships between the fabrication, microstructure and mechanical properties of brittle materials, such as ceramics, glasses and other inorganic materials. This research includes the effect of residual stresses on mechanical behavior. These stresses can give rise to localized failure in composite structures and laminates. For example, thermal expansion match in particulate composites often leads to microcracking. Residual stresses can also be used to strengthen brittle materials. In recent work, it was shown that residual stresses could be designed in such a way as to arrest cracks even in brittle materials while simultaneously improving the resistance to contact damage, increasing strength and reducing strength variability. Residual stresses also play an important role during the co-sintering of multi-component structures. For example, unless properly controlled they can lead to damage and distortion during densification and failure during cooling after fabrication.

Another important research thrust has been the mechanical behavior of porous ceramics, such as foams, fibrous and partially sintered materials. Understanding the micromechanics of the failure process was the main emphasis of this work. The research on porous materials was also extended to understanding mechanical properties of powder compacts. Other research interests include the reliability of ceramics in structural design, failure analysis, fractography and the fabrication and evaluation of transformation-toughened ceramics. Finally, there has been a substantial effort in studying mechanical deformation in inorganic glasses, such as indentation, fatigue and viscoelastic deformation, including the effect of coatings on these properties.