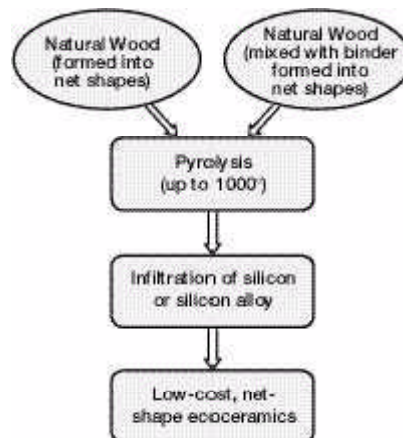


Environment-Conscious Ceramics (Ecoceramics)

Since the dawn of human civilization, there has always been a delicate balance between expanding human frontiers and coexisting with the ecosystem. In the new millennium, it will be extremely important to develop various materials, products, and processes to sustain a healthy life in harmony with nature that allow us to minimize any harmful effects.

Environment-conscious ceramics (ecoceramics) are a new class of materials that can be produced with renewable resources (wood) and wood wastes (wood sawdust). Wood is one of the best and most intricate engineering materials created by nature. Natural woods of various types are available throughout the world. In addition, wood sawdusts are generated in abundant quantities by sawmills. Environment-conscious ceramic materials, fabricated via the pyrolysis and infiltration of natural wood-derived preforms with silicon have tailorable properties with numerous potential applications.



Fabrication process for ecoceramics.

Silicon carbide-based ecoceramics have been fabricated at the NASA Glenn Research Center by the reactive infiltration of wood-derived carbonaceous preforms with molten silicon or silicon-refractory metal alloys (see the figure). These carbonaceous preforms are fabricated by pyrolysis of solid wood bodies up to 1000 °C. The pyrolysis is carried out in a flowing nitro-gen atmosphere. Melt infiltration is then carried out at temperatures above the melting point of silicon or the silicon alloy. The microstructure and mechanical properties (flexural strength and compressive strength) of a wide variety of SiC-based ecoceramics have been measured. Ecoceramics have tailorable properties and behave like ceramic materials manufactured by conventional approaches. The wood-derived carbonaceous preforms have been shown to be quite useful in producing porous or dense materials with different microstructures and compositions. Detailed thermomechanical characterization of a wide variety of silicon-carbide-based ecoceramics is underway.

Find out more from Glenn's Ceramic Branch

(<http://www.grc.nasa.gov/WWW/Ceramics/homepage.htm>) and **Commercial**

Technology Office (<http://cto.grc.nasa.gov/>)

Dynacs Engineering Corporation, Inc., contact: Dr. Mrityunjay Singh, 216-433-8883,
Mrityunjay.Singh@grc.nasa.gov

Author: Dr. Mrityunjay Singh

Headquarters program office: OAT

Programs/Projects: CTO