Ceramic Technology Program – developing cost-effective, high performance ceramic materials for use in a new generation of cleaner vehicles

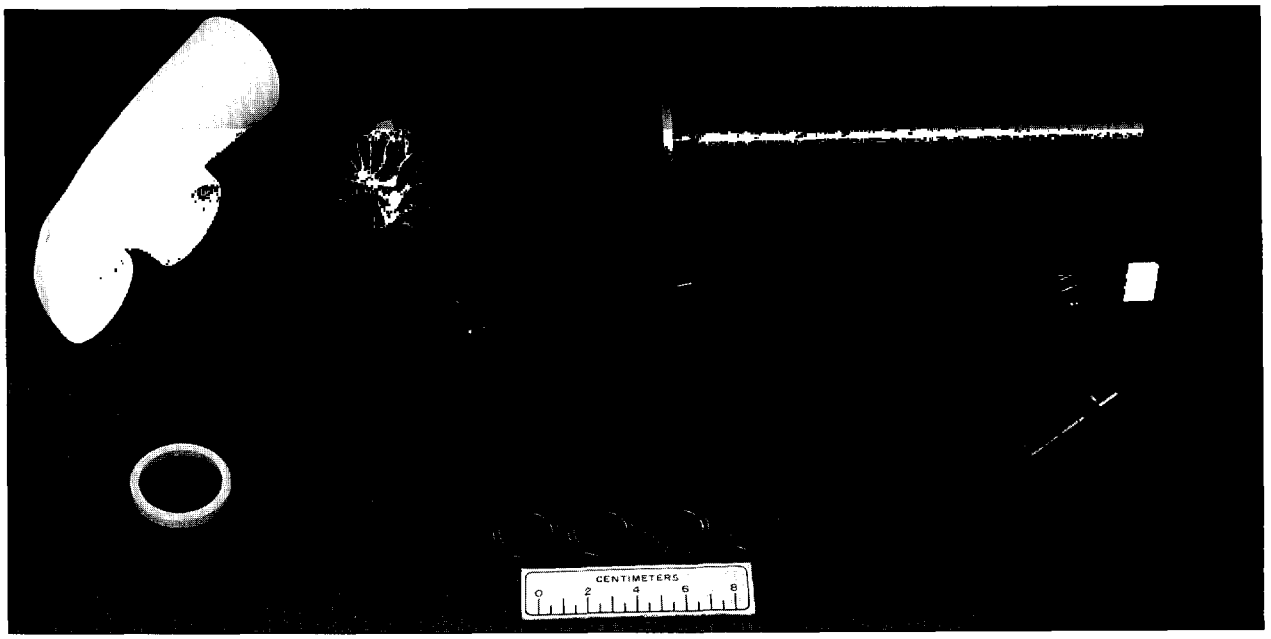
The unique properties of advanced ceramic materials are vital in the development of a new generation of high performance, environmentally friendly vehicle heat engine propulsion systems. Because of their high temperature capabilities, ceramic materials used in gas turbines or hybrid vehicles can improve fuel economy by 30% or more, diminishing adverse environmental impact while reducing American dependence on foreign oil by a projected 275 million barrels annually. In addition, the wear resistance and low mass (density) of ceramics can also provide increased efficiencies in conventional and advanced piston engines.

Building on success

In a previous effort—the 10-year long Ceramic Technology for Advanced Heat Engines Program—the Department of Energy successfully improved synthesis and processing technologies to produce reliable ceramic materials for use in heat engines. The next step is to develop the manufacturing technology that will enable ceramics to become cost-effective for use in civilian ground transportation applications. This will enable American industry to bridge the gap between producing components in costly prototype quantities, and the automated production of large quantities of ceramic components for automotive applications.

Working with the private sector to develop an industrial base

Through the Program's Ceramic Manufacturing Initiative, a consortium of U.S. engine manufacturers and ceramic suppliers will produce simulated ceramic heat engine components in large quantities, gaining valuable experience in mass



A wide variety of ceramic components used in automobile and truck engines. However, their cost is still too high for most production applications in automotive engines.

production. The lines will develop and employ advanced manufacturing techniques, including statistical process control, intelligent processing, and automation. Selected advanced ceramic processing and finish machining technologies will be scaled up as capabilities increase.The DOE will support these process integration activities with the objective of developing a U.S. industrial ceramics production base.

Linked with and supported by valuable government and industry resources

Since its inception, the Ceramic Technology Program's R&D planning has been been developed in concert with industry. The private sector also shares program costs: 60% of appropriated funds are disbursed through competitive procurements to U.S. companies such as Norton, Allied Signal, Carborundum, General Motors and Caterpillar, who in turn share from 20% to 50% of project expenses. Project management and supporting research and technology are accomplished by the Oak Ridge National Laboratory.

The program also benefits from linkages with other government programs through formal agreements. These include:

- Support of international standards and ceramic machining activities at the National Institute of Standards and Technology and non-destructive evaluation activities at the Argonne National Laboratory
- A complementary DOE ceramic components development program managed by NASA
- A joint Transportation Technologies/DOE Defense Programs Ceramic Machining Program centered at the High Temperature Materials Laboratory in Oak Ridge, Tennessee.

This program builds upon these linkages by implementing cooperative research and development agreements (CRADAs) between automotive and ceramic industry representatives and government laboratories, as well as through collaborative R&D contracts.

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