

Oxide/Oxide composite in extreme environment

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Example of an engine part made of a similar material – GE Passport 20

- Mechanical characterization at high temperature
- Influence of the environment
- Determination of constitutive laws

Abstract:

Regarding the demanding technical characteristics relating to a high thrust-to-weight ratio, an increase in service temperatures is needed for high performance aero-engines. This is one of the reasons why advanced ceramics materials such as oxide/oxide composite are currently developed. This kind of materials is now considered in the design of the new generation of engines. The mechanical behavior at room temperature was modeled. However, designer still need some information about their mechanical behavior at high temperature to correctly size the different parts. Consequently, it would be interesting to have a better knowledge of the degradation of their properties at higher temperatures.

In this context, considering the oxide/oxide composites developed at ONERA, a better understanding of their mechanical behavior and even of the degradation mechanisms at high temperature is required. For this objective, composites will be manufactured and mechanically characterized. Tensile and compressive tests in several directions and creep tests will be performed up to 1300°C under laboratory air, inert gas and water vapor. So, the influence of the temperature and the influence of the oxidant species on the degradation mechanisms could be dissociated. After these characterizations, a fine microstructural analysis will allow to understand the physical and chemical mechanisms associated to the damage of the materials.

In parallel, data from mechanical tests will be analyzed and used to develop a model for predicting, versus temperature and atmosphere, mechanical behavior and damage.