

Device and method for material testing in application-related conditions

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CHALLENGE

Detailed knowledge of the materials, which are developed for a specific field of application, represents an essential basis for product engineering. In order to decrease the development time and cost increasingly large portions of product development are carried out virtually. Thus, exact knowledge of the material properties becomes absolutely crucial. For example, special high-temperature materials developed for their use in internal combustion engines require material testing under conditions that replicate this demanding environment. However, typical material tests are carried out in ambient air. Although, the composition of the laboratory air differs significantly from the service conditions in real operation, which can drastically affect the damage behavior of the material.

INNOVATION

The inventors have developed a novel device and method, which enables the generation of an experimental atmosphere closely representing the real application conditions by adding water, harmful substances and particles to a precisely controlled composition of gases. The invention allows for detailed material testing to be carried out in these well-defined conditions. During the tests, both the composition and the volume flow rate of the media can be varied. Making it, for example, possible to simulate the exhaust gas from different load conditions of an internal combustion engine. The inventions enable quasistatic experiments, such as tensile or creep tests, and cyclic experiments, such as thermomechanical fatigue. The test region of the sample is uniformly surrounded by a precisely controlled atmosphere, which also enables high and realistic cooling rates. In summary, the inventions enable development of materials that are excellently suited for their application and improved life-cycle assessment.

COMMERCIAL OPPORTUNITIES

Application specific material testing for streamlined product development. Specifically, the determination of material properties under precisely controlled environmental conditions. Some of the relevant industries include Automotive, Aerospace, Chemical, and Energy.

DEVELOPMENT STATUS

Thoroughly tested prototype.

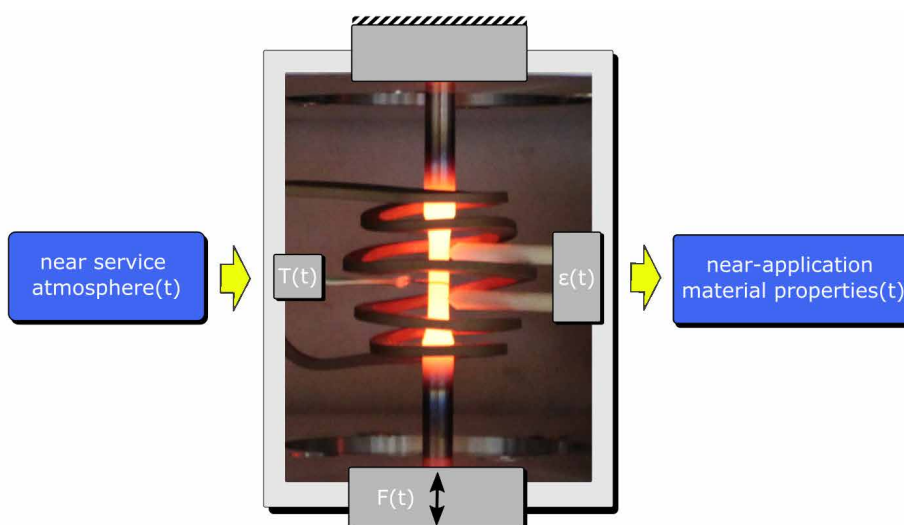


Figure: Illustration demonstrating the variability of device and method. (Left) Precisely controlled time varying atmospheric conditions. (Middle) The material under testing and a time varying applied force. Several probes performing local measurements of strain and temperature. (Right) Measurement results predict the exact material properties under application-relevant conditions.



Technology from
HOCHSCHULE
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