Self-Healing Thermal Barrier Coatings

Fact Sheet

Project Information

<table>
<thead>
<tr>
<th>SAMBA</th>
<th>Funded under</th>
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<tbody>
<tr>
<td>Grant agreement ID: 309849</td>
<td>FP7-NMP</td>
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<td>Project website [🔗]</td>
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<table>
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<tr>
<th>Status</th>
<th>Overall budget</th>
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<tbody>
<tr>
<td>Closed project</td>
<td>€ 4 282 132,36</td>
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<tr>
<td></td>
<td>EU contribution</td>
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<td>€ 3 170 516</td>
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<tr>
<th>Start date</th>
<th>End date</th>
<th>Coordinated by</th>
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<tr>
<td>1 March 2013</td>
<td>28 February 2017</td>
<td>TECHNISCHE UNIVERSITEIT DELFT</td>
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<td>Netherlands</td>
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Objective

This project deals with the creation of a new, unique self-healing thermal barrier coating (TBC) for turbines and other thermally loaded structures in order to realize a significant extension of the lifetime of critical high-temperature components. The concept is based on novel Al2O3 coated Mo-Si particles embedded in the TBC layer, typically consisting of yttria-stabilised zirconia. As the current TBCs do not exhibit any self-repair, the new self-healing TBC will offer a reduction of the number of TBC replacements during an engine lifetime and enhance the reliability of the critical components. Ceramic thermal barrier coatings are applied on the most critical parts of engines, because it enhances the engine efficiency by allowing higher operation temperatures, which saves fuel and thus reduces CO2 emissions. Furthermore, it protects the high-tech structural components against severe high-temperature corrosion and consequently extends the lifetime of these components. The primary

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goal of this project is to realize and optimize the self-healing capacity of thermal barrier coatings with Mo-Si based dispersed particles for application in aero engines and industrial gas turbine engines to prolong the lifetime of their components. This will be achieved through a combined theoretical, experimental and modelling approach of a new, innovative self-healing concept. Upon local fracture of the TBC, these particles fill the crack initially with a glassy phase that subsequently reacts with the matrix to form a load bearing crystalline ceramic phase. This prospective self-healing concept can be exploited to other high temperature structural ceramics as well. The approach as formulated in this proposal has the potential to initiate a new school to design durable high temperature ceramic systems. The project is structured around interrelated work packages, each with clearly defined tasks and deliverables. The project as a whole will span the technology readiness levels (TRLs) 1-5.

Field of science

/engineering and technology/materials engineering/coating and films
/engineering and technology/materials engineering/ceramics
/engineering and technology/environmental engineering/energy and fuels/fossil energy/gas
/natural sciences/physical sciences/theoretical physics/particles

Programme(s)

Topic(s)

Call for proposal

FP7-NMP-2012-SMALL-6

Funding Scheme

CP-FP - Small or medium-scale focused research project

Coordinator

TECHNISCHE UNIVERSITEIT DELFT

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