Delamination-Indicating Thermal Barrier Coatings
Luminescent sublayers reveal previously hidden coating damage.

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The risk of premature failure of thermal barrier coatings (TBCs), typically composed of yttria-stabilized zirconia (YSZ), compromises the reliability of TBCs used to provide thermal protection for turbine engine components. Unfortunately, TBC delamination proceeds well beneath the TBC surface and cannot be monitored by visible inspection.

Nondestructive diagnostic tools that could reliably probe the subsurface damage state of TBCs would alleviate the risk of TBC premature failure by indicating when the TBC needs to be replaced before the level of TBC damage threatens engine performance or safety. To meet this need, a new coating design for thermal barrier coatings (TBCs) that are self-indicating for delamination has been implemented.

This work was done by Eui-Hyek Yang, Daniel Choi, Kirill Shcheglov, and Yoshikazu Hishinuma of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Delamination-Indicating Thermal Barrier Coating is examined as (a) white-light image and (b) Eu²⁺ luminescence image. Enhanced Eu²⁺ 606 nm (red) luminescence detected from scratched region of TBC readily reveals subsurface delamination.