| FV | IGF-Vorhaben | FE | Thema | Projektleiter | Name der Forschungseinrichtung | Beginn | Ende |
|---|---|---|---|---|---|---|---|
| GfKORR | 01IF00380C | 1 | Neuartige Wärmedämmschichten mit polymerabgeleiteten keramischen Zwischenschichten für kritische Komponenten in Flugzeugtriebwerken | PD Dr. M. Galetz | DECHEMA-Forschungsinstitut,<br>Theodor-Heuss-Allee 25<br>60486 Frankfurt am Main | 01.03.2024 | 28.02.2026 |

When it comes to commercial aviation industry and their overall impact on environmental pollution, more and more environmental friendly technologies are needed, as it is stated e.g. in the “Flightpath 2050”, which was passed by the European Union a couple of years ago. From a standpoint of material science, high temperature light-weight materials, such as the so-called titanium aluminide (TiAL) alloys, come to the fore since their implementation could lead to substantial weight savings compared to the state-of-the-art Ni-based superalloys and therefore less fuel consumption and reduced emissions of the airplanes.
Against this background, the key novelty of this project is the adaption of the commercially accepted, state-of-the-art coating concept for Ni-based alloys, consisting of a bond coat and a ceramic Thermal Barrier Coating (TBC), to much lighter TiAL-based alloys. Since TiAL-based alloys suffer from insufficient oxidation resistance at high temperatures as well as from bad wear resistance, a coating concept is needed in order to enable their implementation in hotter stages of today’s turbine engines. Substitution of heavier Ni-based alloys by TBC-coated TiAL turbine blades would lead to huge weight savings and therefore to a much more efficient turbine design.
The GE-TiAL alloy (Ti-48AL-2Cr-2Nb in at.%) will be chosen as the main base material.
A SiAlOC polymer-derived ceramic (PDC) coating will not only ensure the desired oxidation resistance due to the formation of a thin Al203 layer during high temperature exposure, but will also act as a “bond coat” for the outermost TBC layer, which consists of Yttria stabilized Zirconia (YSZ). In contrast to already existing studies dealing with the deposition of YSZ as TBC on TiAL, the deposition of PDC is believed to be able to resolve the critical points mentioned in the literature.