

PI:

Proposal 2

Title:

Formation of Low Growth Rate, Highly Adherent Thermally-Grown Oxides for
--

Please evaluate this proposal according to the two merit: intellectual merit and broader impact.

There are three (3) parts to the evaluation:

1. Rating and Summary Statement,
2. Intellectual Merit,
3. Broader Impacts.

See the discussion at the end of this document for guidance. Your substantive written comments on the proposal's strengths and weaknesses are critical to the evaluation. You may continue on additional sheets if necessary.

Rating

Excellent ☐ | Very Good ☐ | Good ☒ | Fair ☐ | Poor ☐

Excellent	Outstanding in all respects; deserves highest priority for support.
Very Good	High quality in nearly all respects; should be supported if at all possible.
Good	A quality proposal, worthy of support.
Fair	Lacking in one or more critical aspects; key issues need to be addressed.
Poor	Has serious deficiencies.

Summary Statement

Please summarize your evaluation of this proposal, including the extent to which the proposal meets both criteria.

This proposal is a large proposal asking for funding to study thermally grown oxides (TGOs) for thermal barrier coatings (TBCs). To do this research, several different alloys will be characterized, and the chemistry of thermally grown oxides will be examined. The researchers clearly understand the mechanics of how thermally grown oxides work, but optimizing the metallurgy remains a challenge. Most thermally grown oxides are some sort of aluminum oxide based coating, but different dopings and concentrations can have significant effects on oxide development.

For broader impacts, they say the main motivation of this proposal is to work with coatings for turbine engines. Currently materials are limited in wear life and performance by temperature and corrosion limitations. TGOs may address this problem.

Criterion 1: Intellectual Merit

What are the strengths and weaknesses of the the intellectual merit of the proposed activity?

Strengths

The proposal authors have a very deep understand and background of the technology. They are convincing about the possible ways they will create TGOs, and say they will produce several PhDs with this research.

Weaknesses

They do not do a good job outlining what success means, or what new capabilities they will generate. There is a lot of 'determining' happening, and to me, it's not clear that they define what they can be evaluated again. Also, the scope is very broad.

Criterion 2: Broader Impact

What are the strengths and weaknesses of the the broader impacts of the proposed activity?

Strengths

It seems like they're working on what could be a big technology upgrade for high temperature corrosion resistance. They have good partnerships with NASA and Rolls Royce.

Weaknesses

Why is not really answered. There isn't much juice here to demonstrate they really understand the application of this material, or any concrete explanation of the impact of their work other than it can be used 'in the engines of tomorrow'.

Merit Review Criteria

When evaluating proposals, please consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, evaluate all proposals against two merit criteria, given below. Both criteria are to be given full consideration during the review and decision-making processes. Each criterion is necessary but neither, by itself, is sufficient; therefore, proposers must fully address both criteria.

- What is the **Intellectual Merit** of the proposed activity?

The intellectual merit criterion encompasses the potential to advance knowledge. How important is the proposed activity to advancing knowledge and understanding within its own field and across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, please comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

- What are the **Broader Impacts** of the proposed activity?

The broader impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes. How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

The following elements should be considered in the review for both criteria:

- What is the potential for the proposed activity to:
 1. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 2. Benefit society or advance desired societal outcomes (Broader Impacts)?
- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
- How well qualified is the individual, team, or organization to conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?