OMIC R&D TECHNOLOGY BOARD

CONCEPTUAL ABSTRACT

TITLE: Multi-Material Additive Manufacturing

RELATED ROAD-MAPPING DESIGNATION ID#: **AM41**

SUPPORTIVE INDUSTRY: OSU, ATI, BOEING, OREGON TOOL

PROJECT TYPE: General Project

PROBLEM STATEMENT (What Are We Trying to Solve?): Additive Manufacturing (AM) allows for the simultaneous achievement of design freedom and the incorporation of spatially varying properties in the production of multi-material components. For example, implementing the concept of multi-material components in a heat exchanger (HX) result in enhanced thermal diffusivity, shorter path length, and significant reductions in size and mass of HXs. This enables greater heat transfer surface area, vectorized conduction, and reduces channel length, resulting in reduction in size and mass. These benefits are crucial not only for transportation industries like aerospace and automobiles, where space and weight savings are paramount, but also make AM more cost-effective by reducing build time.

PROJECT DESCRIPTION: This project carries with it a very specific focus as outlined below:

- The research should fabricate multi-material components with spatially dependent properties. Robust dissimilar metal joints are essential among all the materials involved. However, joining mechanisms in dissimilar metal AM are not fully understood. The research objective is to optimize multi-material AM processes (e.g., Fe to Cu or Ni to Cu alloys).
- Emphasis should be given to evaluating the bond strength of the multi-material build. Additional material mechanical property characterization would yield higher confidence in project outcomes.
- The research should demonstrate its capabilities by building a part that is a facsimile to a production part of the supportive industry partners, or represents a reasonable subset of production part features. The part selected should represent a functionality need where dissimilar metals are required.
- The measure of success on functionality requirements should be arrived at by consultation with the supportive industry partners.
- The research should demonstrate repeatable reliable performance by way of a reasonable part quantity builds.

Identify Related OMIC R&D Resources: Proposing researchers should use their best judgment in deciding on the optimal resources for the research. To further aid in this decision, the OMIC staff has taken the initiative to best identify on-site resources (machines, equipment, and staff) that may relate to the scope of this research. Please recognize that researchers are not limited to these resources.

- Machines and equipment at OMIC can be reviewed at: ***https://www.omic.us/explore/facility***
- OMIC Staff or SMEs

PROJECT DELIVERABLES:

- Final report
- Final presentation
- All built parts.

SPECIAL NOTE: It should be recognized that this Conceptual Abstract is written based on comments collected during OMIC R&D Road-mapping workshop and based on industries need for applied research. However, researchers as SMEs, are encouraged to lend specific technical feedback to further refine the Project Description and/or Project Outcomes. The proposing researcher may do so either directly to OMIC R&D, or in the submitting proposal.

UTILIZATION OF OMIC RESOURCES: Researchers are encouraged to utilize the capital and personnel resources available on the OMIC R&D campus in their proposals. Use of OMIC time and machines should be included in the Proposal funding request. If use of OMIC resources are not identified in a proposal and are requested during, the project sponsor will be responsible for requesting a costed project amendment from the Tech Board.

PROJECT UPDATE EXPECTATIONS: Researchers are required to have monthly update discussion with OMIC R&D to provide a summary update on project status. This is done by way of a user-friendly format known as the OMIC 6-Block update. Typically, these meetings are scheduled on the first Wednesday and Thursday of each month. Secondly, depending on the scope of the project, OMIC R&D's industry Tech Board representatives are often interested in periodic project updates, and even in project participation. Researchers are required to communicate with supportive industry and facilitate communications as required.

ADDITIONAL COMMITMENTS TO FACTOR: Researchers may be asked to present their final project at an OMIC R&D biennial Technology Exchange Symposium. This symposium is an in-person event, held at the OMIC R&D campus in Scappoose Oregon. The Symposium is held in April, and researchers should factor in their availability when bidding on projects.

Researchers may be invited to participate in OMIC R&D's marketing efforts that showcase the working history of the project.

PROJECT DURATION: Its OMIC R&D's strong preference that duration of a General Project aligns with the academic calendar cycle (July 2024 to June 2025). It is preferred that the project be completed by June 2025. Researchers are encouraged to factor in variables such as contracting, student hiring (if needed), procurement, holidays, and travel. It has been OMIC R&D's experience that a project's useful working duration is typically 9 to 10 months. Researchers are also encouraged to lend feedback, and to adjust the scope of work to best fit this preferred timeframe. Additionally, it is reasonable to even recommend phasing breakdowns to the project. In some unique circumstances, if the project is to take significantly longer than the duration of the academic year, this reasoning should be explicitly explained in the proposal.

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