NASA Developed High Temperature AM Alloys

National Aeronautics and Space Administration

Presenting NX810: An Additively Manufactured Oxide Dispersion Strengthened Alloy

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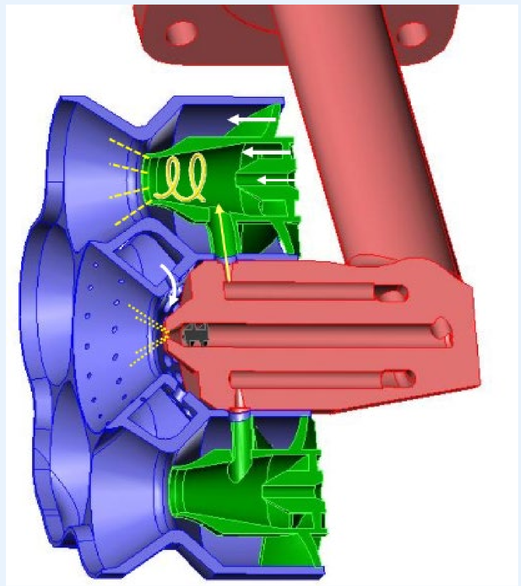
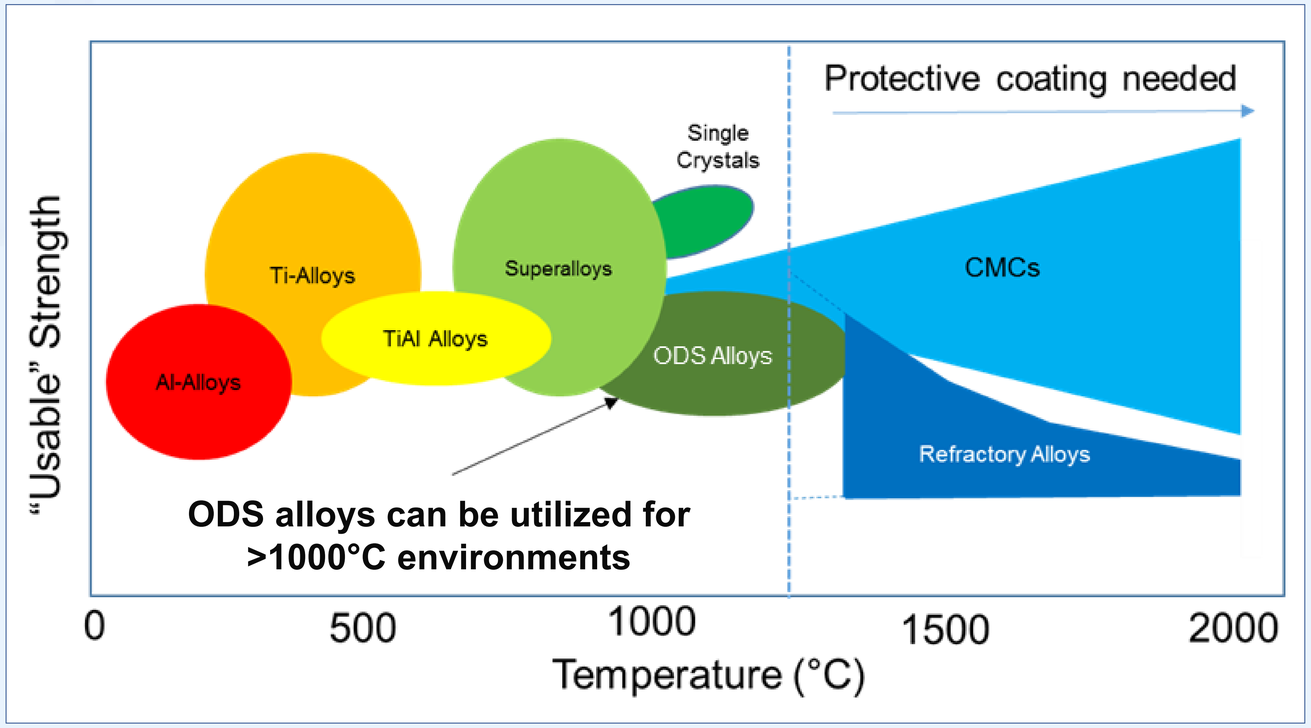
Problem: Conventional materials and processing techniques limit the design and operating temperature of aerospace components.

Proposed Solution: Develop a high temperature capable material that can be additively manufactured and can operate in temperatures above 2000°F (1093°C)



3D printed Combustor Dome Design



Inspired by Andy Jones. ODS alloy Development.

(ODS) alloys offer higher temperature capabilities compared to Ni-base superalloys. However, it has been a challenge to produce ODS alloys through conventional manufacturing methods.

Can additive manufacturing (AM) help realize economical ODS alloys?

IMAGINAVIATION

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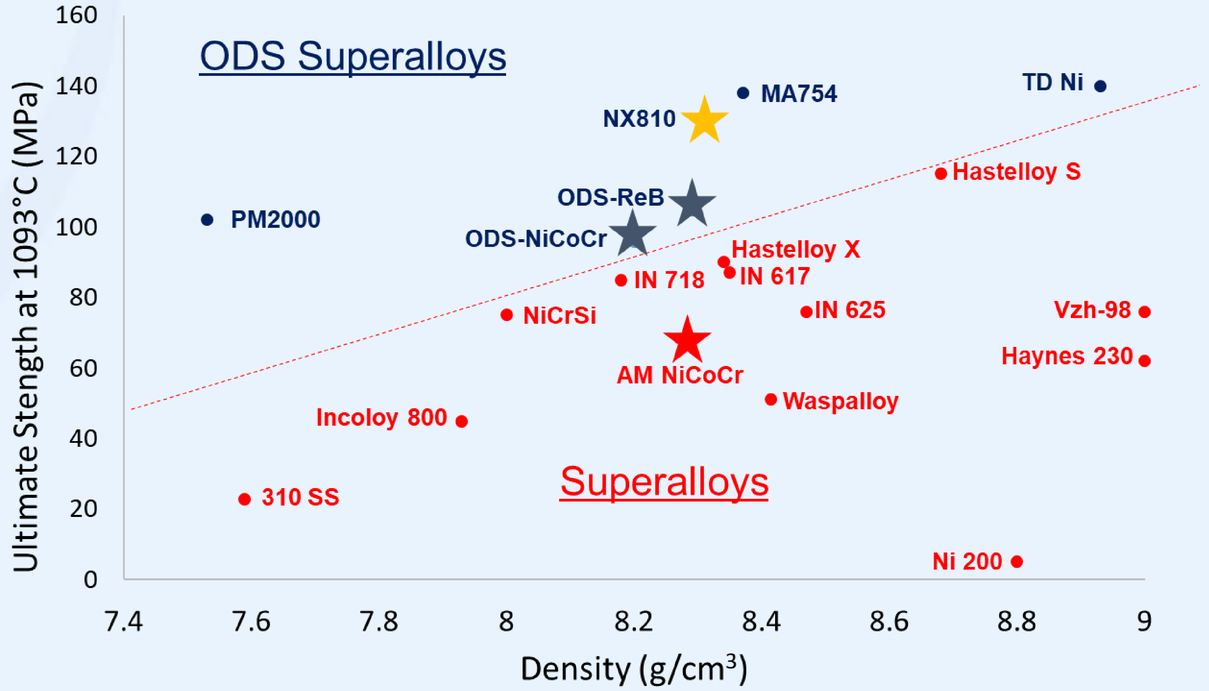
NASA Developed Advanced Dispersion Coating Technique:

- NASA researchers developed a new technique that can coat metallic powder used for AM to be coated with nano-scale ceramic dispersoid such as Y_2O_3 oxides.
- This coated metallic powder could then be 3D printed where the coated ceramics were finely dispersed throughout the build. Thus efficiently creating an ODS alloy.
- Complex 3D printed ODS aerospace components can now be produced efficiently.

3D printed ODS Combustor Dome



NASA Developed High Temperature Superalloy NX810:

- NASA researchers developed a new alloy composition using thermodynamic model predictions. This approach produced results in less time and with lower costs compared to traditional trial-and-error methods.
- Early results from AM ODS alloy NX810 show a 2X improvement in strength, 3.5X improvement in ductility, and a 200X improvement in creep rupture life over conventional superalloys!