COLLINS AEROSPACE CENTER FOR ADVANCED MATERIALS

INNOVATION PARTNERSHIP BUILDING AT UCONN TECH PARK

About

Collins Aerospace is one of the world's largest suppliers of technologically advanced aerospace and defense products. The company designs, manufactures and services integrated systems and components for the aerospace and defense industries, supporting a global customer base with significant worldwide manufacturing and customer service facilities. The Collins Aerospace Center for Advanced Materials, established in 2016, is the result of the continuing collaboration between the two institutes for over two decades. The center offers educational funding to graduate and undergraduate students as well as post-doctoral fellows in areas related to materials development and characterization. It provides an opportunity for firsthand interactions with an industrial partner whose focus is on advanced aerospace and defense products.

Areas of Expertise

- Materials-by-design, materials genomics
- Ab initio calculations of materials properties, surface phase diagrams, precipitation
- Advanced materials characterization (x-ray diffraction, high resolution transmission electron microscopy)
- Thermo-physical property measurements (thermal diffusivity, specific heat, viscosity, thermal expansion), measurement of mechanical properties under extreme conditions (high temperatures, high strain rates)
- Metal additive manufacturing
- Corrosion resistance
- High-T composites, ceramic matric composites
- Chemical vapor deposition (CVD), chemical vapor infiltration (CVI), sol gel deposition, and polymer impregnation processing

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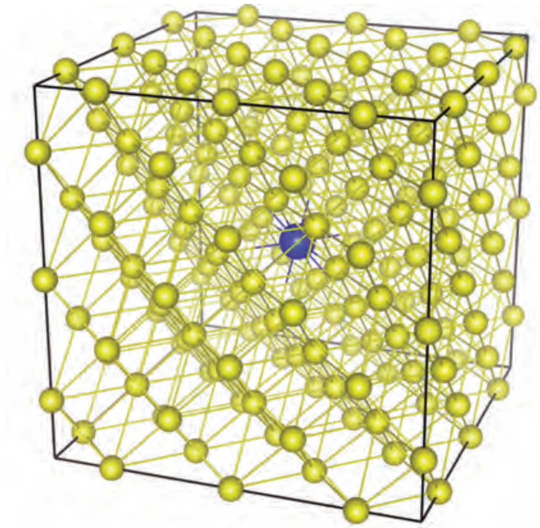
Center Characteristics

The Collins Aerospace Center for Advanced Materials has three main research thrusts:

- Design and development of custom aerospace alloys that lend themselves for additive manufacturing using computational and experimental tools: This is a novel computationally driven experimental approach that aims to design an entirely new generation of Al-alloys with exceptional physiological compatibility, outstanding physical and mechanical properties, high corrosion resistance, high fatigue strength, low elastic moduli (leading to reduced stress shielding), high strength-to-weight ratio, and remarkable manufacturability.
- Processing of high temperature ceramic composites for extreme environments: We specifically concentrate here on designing coatings of ceramic fibers. A variety of coating methods are being used including chemical vapor deposition (CVD), chemical vapor infiltration (CVI), sol gel deposition, polymer impregnation processing, and others. Both SiC and alumina fibers are being employed in this work. Thermal barrier coatings are used to protect these fibers from oxidation and chemical attack.
- Quasicrystal-strengthened alloys for structural applications: This topic focuses on structure-property performance relationships in quasi-crystal-strengthened systems. It is a novel concept developed by UConn scientists with aerospace applications in mind. Such materials are being used to explore the effects of alloy chemistry and post-consolidation thermo-mechanical processing on thermo-mechanical stability of the quasicrystalline phase, mechanical behavior under uniaxial tensile and fatigue conditions, mechanisms and kinetics of dry oxidation, and mechanisms of corrosion with emphasis on the passivity and pitting resistance.



Supercell model used in the atomistic simulations to determine the degree of strengthening in Al (yellow atoms) using substitutional elements (blue atom).

Additional Projects:

In addition to the research activities, the center supports several co-op and internship positions at Collins Aerospace and provides multiple senior design projects in Materials Science and Engineering. These projects focus on materials characterization and testing, metal manufacturing, synthesis of high-temperature ceramics, polymer matric composites, and adhesives.

Contact

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Scanning Electron Microscopy im age of ceramic coated SiC Fibers used in fiber matrix composites. Such coatings will help prevent crack propagation and oxidation from water and oxygen.