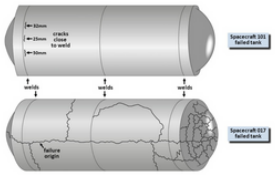
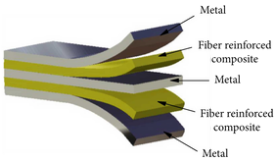
Educational Series & Academy

BASICS OF CORROSION AND PROTECTION OF METALS FOR AEROSPACE

Corrosion Control in the aerospace industry is becoming more critical with the aging of the aircraft fleet. In recent years, the aviation industry in terms of corrosion has been undertaken with million pounds. Corrosion control can be one of the aircraft industry's most effective weapons in the battle against airplane structural failures. Left undetected and/or untreated, corrosion can decrease the load-carrying capacity of primary structures or act as nucleation sites for fatigue or stress corrosion cracks. Thus, corrosion can undermine the integrity of an aircraft and make it unsafe to fly. Therefore, by appropriate selection of materials, maintenance and husbandry, these effects could be decreased.





LEARNING OBJECTIVES

At the end of the course, students are expected to have a basic understanding of the mechanism of corrosion processes and their nature as a function of the environmental physico-chemical conditions. Students will be aware of the synergistic effect of stress and corrosion on materials degradation and failure. He/she is expected to know the corrosion protection methods and strategies and isolate the critical issues responsible for material degradation. Students will learn about corrosion protection and prevention in aerospace engineering, which is necessary for structures' correct design and maintenance.

SYLLABUS

- Fundamentals: General aspects of corrosion processes. Wet and dry corrosion. Electrochemical mechanism of corrosion. Thermodynamics of corrosion. Standard potential, Nernst Equation, and Pourbaix diagrams. Kinetic of corrosion. Passivation conditions. Evans diagrams. Influence of metal on corrosion processes.
- Corrosion types: generalized corrosion, galvanic coupling, pitting corrosion, crevice corrosion, intergranular corrosion, turbulence corrosion, erosion-corrosion, stress corrosion cracking, fatigue corrosion, and hydrogen embrittlement.
- Corrosion of metal alloys for aerospace applications: Aluminium alloys, Magnesium alloys.
- Corrosion protection: paints, metallic coatings, chemical conversion coatings, Anodizing, Plasma Electrolytic Oxidation.
- Corrosion in the aerospace industry: Stress Corrosion Cracking in aircraft structures, Galvanic Corrosion between Mechanically-Coupled Aluminum and Carbon-Fiber Reinforced Epoxy Composites, Thermal barrier coating (TBC) for jet engines, Corrosion in Space.

Target audience: Doctoral students, non-academic professionals, and undergraduate students.

Dates and time: 25 July 2022, 12:00-14:00 and 15:30-17:30 CEST; 26 July 2022, 11:00-14:00 CEST; 27 July 2022, 11:00-14:00 CEST

REGISTRATION AND CONTACTS

Course Code: 20220725

This course is part of the 2022 institutional activity for AIDAA members. The registration requires the purchase of one of the packages described here https://www.aidaa.it/package-list/, and the completion of the online form available on AIDAA webpage.

Course platform: Webex, a link will be sent via email as the registration is complete.
At the end of each course, **attendance certificates** will be sent to participants via email.

For further info, please, contact **academy@aidaa.it**

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SPEAKERS

Francesco Di Franco is Assistant Professor (RTD-B) at Università degli Studi di Palermo. During the academic years 2018/2019 and 2019/2020, he held the course "Corrosion and protection of metals" for Master's students in Aerospace Engineering. Currently, he holds the course "Corrosion and protection of metals" for Master's students in Biomedical Engineering. His research topics are Electrochemical Processes (Anodizing, Electrodeposition, Electropolymerization), Corrosion and protection of metals and alloys, and Membranes fabrication for PEM Fuel Cells.

Andrea Zaffora is Assistant Professor (RTD-A) at Università degli Studi di Palermo. He holds the course “Corrosione e Protezione dei Materiali per l’Aerospazio” for Master students in Aerospace Engineering. His research topics include 1) Anodizing processes for corrosion protection and 2) electrochemical energy conversion by polymer electrolyte fuel cells.