IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

**Project title:** Development of Corrosion Resistance Conducting Polymer Coatings

**Project number: IMURA0113**

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## Research Academy theme/s

1. Nanotechnology

## The problem

Organic coatings are an efficient way to protect metallic substrates from corrosion, and such coatings are a critical to the airworthiness of modern aircraft. For reliable long-term performance inorganic pigments that release corrosion inhibiting substances are usually added to organic coatings. To date, all powerful corrosion inhibitors may have detrimental effects on the environment and human health due to their toxic and carcinogenic nature (i.e. chromates). Conducting polymers (CPs) represent a class of interesting materials currently being explored for use in corrosion control coating systems, possibly as a replacement of heavy metals, zinc containing primers for corrosion control of steel and the chromate-containing primers for corrosion control of aluminum alloys and galvanized steel. The research work will focus on the development of corrosion resistance coatings by choosing either: a) a suitable conducting polymer alone, or b) a combination of polymers / compounds (comprising what we define as a coating 'system'). Characterisation will involve detailed Electrochemical Impedance Spectroscopy, additionally including Electropolarisation tests, SEM, TEM, FTIR, and Salt-spray / environmental testing.

## Project Aims

Aims of the project are:

a) Progress towards environmental friendly corrosion resistant coatings via the synthesis of conducting polymers from substituted monomers or by copolymerisation of ordinary and conducting polymers for effective.

b) Customise (i.e. enhance / tailor) the corrosion resistance properties that can be achieved by incorporation of nano-structured particulates in coating.

c) Application of the abovementioned coatings to aerospace alloys for susbsequent application to the aircraft industry.

## Expected outcomes

a) This work will potentially provide advanced materials (i.e. the coatings developed in this project), which can be used in the context of corrosion protection of metallic substrates. This will generate new knowledge, and depending on the corrosion protection ability, new coating formaulations.
b) Fundamental knowledge regarding the impact of nano particles incorporation in conducting polymer coatings - in order to enhance other end user properties.