

Project Title: Developing Nanostructured Coatings for Engineering Applications
Supervisor's Name: Dr Arunachalam Ramanathan
Co-Supervisor(s): Dr Majid Al Maharbi
Sources of Fund: TRC

Research Field(s): Pulse electrodeposition
Summary and Problem Statement: Nanostructured High Entropy Alloy (nHEA) coatings are a new class of novel alloys that have potential applications in several industries including oil and gas, automotive, aerospace and biomedical. Compared to the current industry standard coatings, nHEA coatings (e.g. FeCoCrAlNi, CrMnSiCuFeAlTi) are expected to exhibit improved corrosion and wear resistance properties that could prolong the service life of engineering components resulting in improved profit margin. Based on the literature, appropriate HEA coating will be selected and pulse electrodeposition (PED) will be used to deposit on API X-65 grade of stainless steel. The developed coating will be characterized for corrosion and wear resistance.
Keywords: Nanostructured High Entropy Alloy Coatings (nHEA), Corrosion and Wear, Oil & Gas, Pulse Electrodeposition
Objectives: <ol style="list-style-type: none">1. Identify potential nHEA coating composition (principal elements)2. Use pulse electrodeposition to deposit the nHEA coating.3. Measure corrosion parameters and explain the behaviour of corrosion occurring on the nHEA coating4. Analyze the morphology and composition of the nHEA coating5. Study the tribological properties of the nHEA coatings
Tentative Methods of Approach: Pulse electrodeposition

Required backgrounds and skills
Backgrounds: Knowledge of nanomaterials included synthesize and characterization. Preferably, should have taken the elective course MEIE6166 (Nanomaterials)
Computing Skills:
Other requirements:

References: Yoosefan, F., Ashrafi, A., Monir vaghefi, S. et al. Synthesis of CoCrFeMnNi High Entropy Alloy Thin Films by Pulse Electrodeposition: Part 1: Effect of Pulse Electrodeposition Parameters. Met. Mater. Int. 26, 1262–1269 (2020). https://doi.org/10.1007/s12540-019-00404-1
--