Proposal for announcing seat under the Institute Internship Program

(separate form to be filled for seat under Institute funding and project funding)

1. **Name of faculty member proposing:** Dr. Brij Mohan Mundotiya
2. **Department/Centre-** Metallurgical & Materials Engineering
3. **Topic on which work is proposed:** Electrodeposition and corrosion study of high entropy alloy
4. **Preferred period of internship (after May 20th):** Between 20-5-2024 to 20-7-2024
5. **Qualification of student (branch/semester of study):** 4th semester (Metallurgy and Materials Engineering - IIEST, Shibpur)
6. **Brief description of work (300-500 words):** Electrodeposition of FeCONiWMO high entropy alloy (HEA) coatings has garnered significant interest due to their promising mechanical, chemical, and thermal properties. These coatings, composed of multiple principal elements in near-equal atomic percentages, offer unique advantages over traditional alloys. This brief study aims to explore the electrodeposition process of HEA coatings and investigate their corrosion resistance properties.

   High entropy alloys (HEAs) typically comprise four or more metallic elements mixed in roughly equiatomic proportions. This unique composition produces a solid solution with exceptional structural stability and mechanical strength. Moreover, the configurational entropy associated with the random mixing of elements provides increased resistance to phase separation and grain growth, making HEAs particularly appealing for various applications.

   The electrodeposition process of HEA coatings involves several steps. Initially, a suitable electrolyte solution containing salts of the desired alloying elements is prepared. Parameters such as pH, temperature, and deposition potential are carefully controlled to optimize the deposition process and achieve the desired coating properties. The substrate material onto which the coating will be deposited is chosen based on the application requirements.

   During electrodeposition, metal ions from the electrolyte solution are reduced and deposited onto the substrate surface, forming a uniform coating. The composition and microstructure of the HEA coating can be tailored by adjusting the deposition parameters and the composition of the electrolyte solution.

   After electrodeposition, the as-deposited HEA coating undergoes various characterization techniques to assess its microstructure, composition, and properties. Techniques such as scanning electron microscopy (SEM), X-ray diffraction (XRD), and energy-dispersive X-ray spectroscopy (EDS) provide valuable insights into the morphology, crystal structure, and elemental composition of the coating.

   Once the HEA coating is characterized, corrosion studies are conducted to evaluate its resistance to chemical degradation in corrosive environments. Techniques such as potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) are commonly used to assess the corrosion behavior of HEA coatings. Overall, the electrodeposition and corrosion study of HEA coatings offers valuable insights into their potential as protective coatings in various industrial applications.
7. **Expected learning of student (upto 100 words):** Electrodeposition and high entropy alloy (HEA) studies can expect to gain a comprehensive understanding of electrochemical processes, alloy formation, and the unique properties of HEAs. They will learn about electrodeposition techniques, including parameter optimization and coating characterization. Additionally, students will delve into the principles behind HEAs, exploring their composition, microstructure, and mechanical properties. Through experimental work and analysis, students will develop material synthesis, characterization, and corrosion testing skills, enhancing their knowledge of advanced materials and their applications in various industries.

8. **Nature of work: (Experimental/simulation/mathematical modelling/data collection-analysis etc.):** Thin film coating by electrodeposition method (Experimental Work)

9. If the seat is under project sponsored category: No
   a) If yes, number of seats announced:
   b) Name and ID no. of project from which stipend is chargeable

Signature of faculty member

Name of department/Centre

Department of Metallurgical & Materials Eng.

Note:

a) Proposing faculty member needs to be available at the Institute during the period internship is offered
b) No extra space or funding than the stipend will be provided by the institute for this purpose

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