

## Understanding Corrosion using a Multiscale Electrochemical Approach

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Much of our fundamental understanding of corrosion relies on the assumption that metallic materials uniformly corrode. Yet, it is estimated that 75% of corrosion failures are due to corrosion that initiates at a specific location along the material's surface. This localized corrosion is difficult to predict, detect, and quantify before detrimental damage has occurred.<sup>1</sup> To investigate localized corrosion initiation mechanisms, scanning electrochemical probe microscopy (SEPM) methods have become useful tools for corrosion scientists.<sup>2</sup> The advancement and standardization of SEPM is crucial for the development of longer lasting and safer materials, where feedback loops between characterization researchers and material developers can be made to accelerate the improvement of fabrication processes.

In this seminar, I will discuss some of my research efforts using a multiscale electrochemical approach to understand the corrosion of thermal spray coatings to prolong the lifetime of hydraulic turbine infrastructure.<sup>3,4</sup> This approach and my interest in metal coatings will be expanded to cold spray coatings that are being proposed as a protection method for used nuclear fuel waste containers.<sup>5</sup> I will end the discussion by sharing my aspirations to challenge an outdated contraceptive technology by benefiting the advancements in coating methods and corrosion knowledge that could improve negative side effects and user experience of non-hormonal intrauterine devices.

1. F. Dabosi, G. Béranger, and B. Baroux, in *Corrosion localisée*, 1st edition, p. 697, Les Ulis, France: Les Editions de Physique (1994).

2. N. A. Payne, L. I. Stephens, and J. Mauzeroll, *Corrosion*, **73**, 759–780 (2017).

3. S. M. Gateman et al., *npj Mater. Degrad.*, **3**, 25 (2019).

4. S. M. Gateman et al., *npj Mater. Degrad.*, **2**, 5 (2018).

5. D. S. Hall, M. Behazin, W. Jeffrey Binns, and P. G. Keech, *Prog. Mater. Sci.*, 100766 (2020).