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EPFL Valais/Wallis SEMINAR

15. 05. 2024, 13:30 - 14:00, EPFL Valais/Wallis in Sion, 4th floor, Zeuzier Room

Conversion of core@shell nanoparticles to high entropy alloy nanoparticle catalysts

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High entropy alloys consist of equal or near equal amounts of five or more principal elements, being stabilized by their high entropy of mixing. Historically, high entropy alloys have been studied as structural materials, but with the development of synthetic pathways to high entropy alloy nanoparticles, their interest as catalysts has been growing. The direct colloidal synthesis of high entropy alloy nanoparticles is challenging given the different conditions under which various precursors must be reduced or decomposed. To address this challenge, we showed that core@shell nanoparticles can be synthesized first and then annealed at elevated temperatures to facilitate intermixing and the formation of the high entropy alloy phase.[1] Here, the design of the precursor core@shell nanoparticles will be discussed, establishing that this nanocrystal conversion pathway is a general strategy to high entropy alloy nanoparticles. The catalytic performance of these nanocrystals will also be discussed as a function of composition for the oxygen reduction reaction, showing strong dependence on metal identity and degree of intermixing.

References:

(1) Kar, N.; McCoy, M.; Wolfe, J.; Bueno, S. L. A.; Shafei, I. H.; Skrabalak, S. E. Retrosynthetic Design of Core–Shell Nanoparticles for Thermal Conversion to Monodisperse High-Entropy Alloy Nanoparticles. *Nat. Synth.* **2024**, *3* (2), 175–184. https://doi.org/10.1038/s44160-023-00409-0.

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Born in 1980 in Altoona, PE, Sara Skrabalak graduated with a B.S. in Chemistry (Summa Cum Laude) from the University of Washington in 2002. She then went on to pursue graduate studies at the University of Illinois Urbana-Champaign, where she obtained her PhD degree in 2007. Her doctoral thesis focused on Porous Materials Prepared by Ultrasonic Spray Pyrololsis. She then worked at University of Washington Seattle as post-doctoral fellow with Prof. Younan XIa. And in 2008 she became Assistant Professor at the Indiana University, Bloomington, where became Full Professor and Adjuct Professor in Chemistry and Intelligent Systems Engineering in 2017 and has remained since. As of 2020, she is Editor-in-Chief at two ACS journals: Chemistry of Materials and ACS Materials Letters.