

# BRANDI COSSAIRT

Lloyd E. and Florence M. West Endowed Professor of Chemistry  
University of Washington



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10:30 AM - 11:30 AM

Steele 006

## “Unlocking Atomic Precision Across Length Scales for the Synthesis and Assembly of Hybrid Nanomaterials”

**Abstract:** Achieving atomic precision in both synthesis and assembly is a central challenge in creating hybrid nanomaterials with programmable structure and function. First, I will discuss how principles from molecular inorganic chemistry can be leveraged to decode the formation of colloidal semiconductor nanocrystals. By isolating and characterizing magic-sized clusters, we uncover molecular blueprints that illuminate how bonding, reactivity, and structural evolution guide the emergence of larger nanocrystals. These insights reveal evolutionary relationships between distinct cluster families, clarify how structural transformations shape crystallization pathways, and highlight how surface chemistry modulates luminescence, offering new levers for tailoring optical behavior at the nanoscale. In the second part, I will turn to sequence-defined polymers as atomically tunable building blocks for directing assembly. I will first describe our work on peptoid-mediated organization of quantum dots (QDs) and then introduce elastin-like polypeptides (ELPs) as programmable actuators of QD assembly. Through a modular two-step ligand exchange, the resulting ELP:QD hybrids exhibit thermally reversible coacervation, modulating interparticle spacing. Strikingly, we observe robust chirality transfer from the terminal cysteine residue of the ELP into QD optical transitions. Further, we can maximize this chiral response and impose defined binding geometries on nanorod surfaces to amplify interfacial chirality, with circular dichroism serving as a sensitive probe of protein coordination.

**Bio:** The Lloyd E. and Florence M. West Endowed Professor Brandi Cossairt received her B.S. in Chemistry from the California Institute of Technology in 2006 and her Ph.D. from the Massachusetts Institute of Technology in 2010, working with Professor Christopher C. Cummin. She then served as an NIH NRSA Postdoctoral Fellow at Columbia University, working with Professor Jonathan Owen, before joining the Department of Chemistry at the University of Washington as an Assistant Professor in 2012. Her research group examines the nucleation, growth, surface chemistry, and reactivity of nanoscale materials to enable next-generation technologies in the diverse areas of displays, lighting, catalysis, quantum information, and hybrid matter. She has received a number of awards, including a Sloan Research Fellowship, a Packard Fellowship, an NSF CAREER Award, a Dreyfus Teacher-Scholar Award, and the National Fresenius Award. Brandi is an Associate Editor at the ACS journal Inorganic Chemistry and is the co-founder of the Chemistry Women Mentorship Network (ChemWMN).