



Talk

Colloidal Nanocrystals of Metals and Intermetallics

Prof. Dr. Maksym Yarema

ETH Zürich

Host: Maria Ibáñez

Bimetallic compounds are a vast family of materials with >20000 unique members and record-high performances in catalysis, plasmonics or energy-storage technologies. In strong dissonance, the universal synthesis for polymetallic nanocrystals is missing, due to challenges to combine two dissimilar metals at the nanoscale. We overcome this limitation by the amalgamation reaction at the surface of nanocrystals, thus unlocking up to a 1000 of new intermetallic nanocrystals with unprecedented quality for size uniformity, composition control, and phase purity. [1] Starting from monometallic seeds, we carry out a thermal decomposition of metal-amides to dispatch low-melting metals to the surface of nanocrystals and thus trigger a time-efficient and homogeneous alloying to bimetallic compositions. Our new synthesis is convenient and reproducible universal method for high-quality intermetallic nanocrystals, providing uniform compositions and phase purity already after a few minutes of reaction (short reaction time is the key for excellent size distributions). Finally, nanoscale amalgamation gives access to unique bimetallic nanocrystals of very dissimilar metals (like Au and Ga), [2] which is impossible via traditional coprecipitation methods. References:[1] J. Clarysse, A. Moser, O. Yarema, V. Wood, and M. Yarema*. Size- and Composition-Controlled Intermetallic Nanocrystals via Amalgamation Seeded Growth. *Sci. Adv.* 2021, 7, eabg1934.[2] J.-M. von Mentlen, J. Clarysse, A. Moser, D. Kumaar, O. Yarema, T. Sannomiya, M. Yarema*, and V. Wood*. Engineering of Oxide Protected Gold Nanoparticles. *J. Phys. Chem. Lett.* 2022, 13, 5824-5830. Bio:Maksym Yarema is Assistant Professor in the Institute for Electronics, ETH Zurich, where he leads a research group focusing on Chemistry and Materials Design. Maksym was born and raised in Ukraine, where he received bachelor and master degree in chemistry from Lviv National University. In 2012, he earned PhD in engineering from Johannes Kepler University in Linz, Austria. The same year, he moved to Switzerland and joined ETH domain: first as a postdoc at EMPA, then as a senior scientist and now as a faculty. Maksym is a recipient of several prestigious research grants, among which Marie Curie postdoc, SNF Ambizione fellowship and ERC Starting grant. His research interests span various topics of chemistry, materials science and chemical engineering. Particular focus is given to colloidal nanomaterials, their synthetic approaches and applications into optoelectronic devices, memory cells, and lithium-ion batteries.

Friday, April 28, 2023 11:00am - 12:00pm

Sunstone Building - Big Seminar Room B



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