Recent MXene developments in Indiana and potential for collaboration

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Location
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Two-dimensional (2D) transition metal carbides, nitrides, and carbonitrides, known as MXenes, have grown in the past decade from a newly discovered material to a large family of 2D materials. MXenes have a wide array of material properties, including solution-processability and hydrophilicity (surfactant-free nanoinks), high electrical conductivity and 2D stiffness, functionalized surfaces, and chemical and structural tunability. MXenes have been extensively investigated for applications such as energy storage, catalysis, sensing, biomedical, and electromagnetic interference shielding.

In this talk, I will focus on the new developments and projects that we started in the past three years at IUPUI and Purdue, including the first report on high-entropy MXenes, the expansion of ordered double-metal MXenes, the introduction of tungsten-titanium MXene, and exploring rare-earth MXenes and their potential applications which require collaborative studies. I will also discuss our recent findings on MXenes and their composites for extreme environments by benefiting from their transition metal carbide core and their layered structures.

Dr. Babak Anasori is an Assistant Professor at IUPUI and the Editor-in-Chief of the Graphene and 2D Materials, a Springer-Nature journal. Dr. Babak Anasori received his PhD at Drexel University in 2014 in the Materials Science and Engineering Department, the birthplace of MXenes. Before joining IUPUI, he was a Research Assistant Professor at the A.J. Drexel Nanomaterials Institute and Materials Science and Engineering at Drexel University from 2016 to 2019. Dr. Anasori has more than 150 refereed publications on MXenes and their precursors, and he is among the Web of Science Highly Cited Researchers in 2019, 2020, 2021, and 2022. He is also 7th on the 2022 list of Rising Stars of Science in the USA by Research.com. He has received several international awards, including the 2016 Materials Research Society (MRS) Postdoctoral Award, the 2021 Drexel University 40-under-40, and the 2021 WIN Rising Star Award in Nanoscience and Nanotechnology. Dr. Anasori's research lab at IUPUI is currently supported by the U.S. National Science Foundation (NSF), Department of Defense (DoD), and Department of Energy (DOE). His lab works on developing novel 2D carbide and carbonitride MXenes for various applications, including energy generation, electromagnetic interference shielding, and ultra-high temperature ceramics.

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