

Chemistry and Electrochemistry of 2D Carbides and Nitrides (MXenes)

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Abstract:

2D carbides and nitrides, known as MXenes, are among the most recent, but quickly expanding material families [1]. The field is experiencing very fast growth with the number of papers on MXenes doubling every year. Major breakthroughs have been achieved in the past 2-3 years, including the discovery of 2D M_5C_4 carbides with the twinned layers and CVD synthesis of $MoSi_2N_4$, representing a new family of 2D nitrides. Synthesis of dozens of predicted MXenes, demonstration of superconductivity in MXenes with specific surface terminations, stronger interactions with electromagnetic waves compared to metals, metallic conductivity combined with hydrophilicity and redox activity, led to exploration of numerous applications. Reversible redox activity of transition metal atoms in the outer layers of MXene flakes combined with high electronic conductivity led to applications in a variety of batteries and electrochemical capacitors. MXenes are promising candidates for energy storage and related electrochemical applications, such as electrocatalysis, but applications in optoelectronics, plasmonics, electromagnetic interference shielding, medicine, sensors, catalysis and water desalination are equally exciting.

1. A. VahidMohammadi, J. Rosen, Y. Gogotsi, The World of Two-Dimensional Carbides and Nitrides (MXenes), *Science*, **372**, eabf1581 (2021)

Biography:

Yury Gogotsi is Distinguished University Professor and Charles T. and Ruth M. Bach Professor of Materials Science and Engineering at Drexel University. He also serves as Director of the A.J. Drexel Nanomaterials Institute. His research group works on 2D carbides, nanostructured carbons, and other nanomaterials for energy, water and biomedical applications. He is recognized as Highly Cited Researcher in Materials Science and Chemistry, and Citations Laureate by Thomson-Reuters/Clarivate Analytics. He has received numerous awards for his research including the ACS Award in the Chemistry of Materials, Gamow Prize, European Carbon Association Award, S. Somiya Award from IUMRS. He has been elected a Fellow of the American Association for Advancement of Science, Materials Research Society, American Ceramic Society, the Electrochemical Society, Royal Society of Chemistry, International Society of Electrochemistry, as well as the World Academy of Ceramics and the European Academy of Sciences. He holds honorary doctorates from the National Technical University of Ukraine, Frantsevich Institute for Problems of Materials Science, National Academy of Sciences, Ukraine, and Paul Sabatier University, Toulouse, France. He is acting as Associate Editor of *ACS Nano*. He has more than 100 publications in conference proceedings, and more than 800 articles in peer reviewed journals, credited on more than 80 European and US patents (more than 30 licensed to industry) and more than 250 plenary, keynote and invited lectures and seminars. He has been cited over 100,000 times and currently has an h-index of 175 (Google Scholar) / 152 (Web of Science).

