SYNTHESIS AND APPLICATION OF $Ti_3C_2T_X$ MXENES FOR DRINKING WATER QUALITY ASSESSMENT

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Water pollution remains a pervasive problem, leading to 1.8 million deaths each year and posing significant threats to human, animal, and plant health. The main sources of water contamination include industrial and agricultural waste, maritime traffic, and fuel spillages, releasing millions of tons of pollutants into the water worldwide [1]. The challenges in detecting and removing certain pollutants highlight the necessity of innovative solutions for environmental applications.

MXenes is a novel family of two-dimensional (2D) inorganic nanomaterials, first discovered in 2011 at Drexel University's College of Engineering. The MXene family, with the general structure of $M_{n+1}X_nT_x$, where M is a transition metal, X is C and/or N, and T_x is the surface functional group, consists of transitional metal carbides, nitrides, and carbonitrides [2]. Due to their large surface area, simple surface functionalization, tunable hydrophilicity, biocompatibility, and high adsorption capacity of both organic and inorganic materials, MXenes hold great promise in various fields, including electronics, energy storage, energy conversion, and biotechnology. In particular, MXenes could be a promising solution for assessing drinking water quality and pollutant removal [3].

In this study, we successfully synthesized and applied spherical and layered -SO_4 and -F functionalized $Ti_3C_2T_x$ MXenes to detect water pollutants of various origins. Our findings demonstrate the effectiveness of the synthesized MXenes in detecting different chemical compounds, offering valuable insights into the potential application of -SO_4 and -F functionalized $Ti_3C_2T_x$ MXenes in wastewater treatment.

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