Molybdenum carbide nanosheets

Molybdenum carbide (Mo2C) nanosheets refer to nanoscale structures composed of molybdenum and carbon atoms arranged in a two-dimensional (2D) sheet-like structure. Molybdenum carbides are part of the family of transition metal carbides, and they have attracted attention in various research fields due to their unique properties and potential applications.

Here are some key points about Mo2C nanosheets:

Structure: Mo2C nanosheets have a layered structure in which molybdenum atoms are bound to carbon atoms. The arrangement of these atoms in a 2D structure can result in unique electronic, mechanical, and catalytic properties.

Properties:

Catalytic Activity: Mo2C is known for its catalytic activity, especially in various chemical reactions. It has been explored as a catalyst in reactions such as hydrogen evolution, oxygen reduction, and nitrogen reduction reactions. Electronic Properties: The 2D nature of nanosheets can lead to interesting electronic properties, making them potentially useful in electronic devices. Applications:

Catalysis: Due to its catalytic properties, Mo2C nanosheets have been studied for applications in catalysis, particularly in fuel cells and other electrochemical processes. Energy Storage: The unique properties of Mo2C nanosheets make them attractive for energy storage applications, such as in supercapacitors. Sensors: The high surface area and reactivity of nanosheets make them promising for sensor applications. Synthesis: Various methods can be employed to synthesize Mo2C nanosheets, including chemical vapor deposition, solvothermal methods, and other techniques that allow for the controlled growth of 2D structures.

It's important to note that research in the field of nanomaterials is ongoing, and the properties and potential applications of Mo2C nanosheets continue to be explored and refined. The specific properties and applications may depend on factors such as the synthesis method, size, and morphology of the nanosheets.

Zhang et al. developed a photothermal therapy (PTT) based on Molybdenum carbide nanosheets for melanoma treatment while utilizing integrated metabolomics to investigate the metabolic shift of metabolome combined lipidome during PTT at the molecular level. The results demonstrated that 1 mg ml-1 Mo2C nanosheets could efficiently convert laser energy into heat with a strong and stable photothermal effect (74 ± 0.9 °C within 7 cycles). Furthermore, Mo2C-based PTT led to a rapid decrease in melanoma volume (from 3.299 to 0 cm2) on the sixth day, indicating the effective elimination of melanoma. Subsequent integrated metabolomics analysis revealed significant changes in aqueous metabolites (including organic acids, amino acids, fatty acids, and amines) and lipid classes (including phospholipids, lysophospholipids, and sphingolipids), suggesting that melanoma caused substantial fluctuations in both metabolome and lipidome, while Mo2C-based PTT helped improve amino acid metabolism-related biological events (such as tryptophan metabolism) impaired by melanoma. These findings suggest that Mo2C nanosheets hold significant potential as an effective therapeutic agent for skin tumors, such as melanoma. Moreover, through exploring multidimensional bioinformation, integrated metabolomics technology provides novel insights for studying the metabolic effects of tumors, monitoring the correction of metabolic abnormalities by Mo2C nanosheet therapy, and evaluating the therapeutic effect on tumors [1].

[1]

Zhang D, Wang M, Li Y, Liang G, Zheng W, Gui L, Li X, Zhang L, Zeng W, Yang Y, Zeng Y, Huang Z, Fan R, Lu Y, Guan J, Li T, Cheng J, Yang H, Chen L, Zhou J, Gong M. Integrated metabolomics revealed the photothermal therapy of melanoma by Mo2C nanosheets: toward rehabilitated homeostasis in metabolome combined lipidome. J Mater Chem B. 2024 Jan 2. doi: 10.1039/d3tb02123h. Epub ahead of print. PMID: 38165726.