سمینار هفتگی ماده چگال نرم

Design and Development of Electrochemical Biosensors Based on Two-dimensional (2D) Materials

Saba Ranjbar

Physics Department

Sharif University of Technology

Abstract

The unique properties of nanostructured materials offer excellent prospects for interfacing biological recognition events with electronic signal transducer and for designing a new generation of electrochemical bio-sensing devices exhibiting novel functions. Two-dimensional materials have attracted great attentions in diverse healthcare applications as an active sensing element or a supporting substrate owing to exceptional and often tunable electrical, optical, electrochemical, and physical properties. MXene nanosheets with layered morphology are a rapidly growing family of 2D materials based on transition-metal carbides and nitrides that have shown great potential as multifunctional nanomaterials. Their unique combination of metallic conductivity, hydrophilicity, and highly charged surfaces endow them with excellent electrochemical performance. Here, we will propose a new way to simultaneous exfoliation and functionalization of MXene based on glucan multivalent interactions (using dextran). The hydrogen bonding of dextran with bulk MXene in liquid phase, produce MXene nanosheets with binding multivalency which make them specific and effective host for the capture of Escherichia coli O157:H7 (E. coli O157:H7) as a pathogenic bacteria. This antibody and aptamer-free strategy can provide a cost-effective and durable platform to E. coli detection in clinical and environmental real samples. Density functional theory (DFT) simulation will be applied to the investigation of the multivalent hydrogen bonding between dextran and MXene, and also affinity of MXene -dextran to E. coli O157:H7 compared to the other pathogenic bacteria.

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مکان(کلاس مجازی آقای دکتر اجتهادی) :

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