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An Eco-friendly nanocatalyst for removal of some poisonous environmental pollutions and statistically evaluation of its performance

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Abstract

Through an ecofriendly, economic and one pot method, the TiO_2@Fe_3O_4@Quartz nanocomposite (NCs) was fabricated using the antioxidant potential of the Allium *tricoccum* extract and quartz as a natural geosubstrate (G.S). Also, high performance liquid chromatography (HPLC) analysis of the plant and evaluation of its total phenolic content (TPC) revealed its high potential to biosynthesis of the catalyst. The ecofriendly catalyst structurally elucidated using the SEM, EDS, Elemental mapping, XRD and FT-IR techniques. Moreover, the catalytic potential of TiO_2@Fe_3O_4@Quartz NCs was studied for removal of some hazardous materials including polycyclic aromatic hydrocarbons (PAHs), azo dyes and the reduction of dangerous hexavalent Cr(VI) and 2,4-dinitrophenyl hydrazine (2,4-DNPH) at ambient conditions in which analysis of the surface of nanostructure using GC-Mass demonstrated a significant removal of poisonous PAHs from the crude oil sample. Besides experimental investigating of the catalyst performance, the statistical analysis was used to evaluation the optimal amount of the catalyst for each reaction. Furthermore, beside the presentation of all reaction mechanisms, the reusability for TiO_2@Fe_3O_4@Quartz NCs revealed its recoverability for consequent times with no meaningful loss of its activity.