

Green Synthesis of Goethite particles using different herbal plants, and their applications as Fenton-Like Catalyst In the degradation of Malachite Green as a type of a carcinogen material, and other organic dyes.

S. Abu Sirriah^a, T. Shahwan^a, E. Boyaci^b, A. E. Eroglu^b, T. Scott^c,
K. R. Hallam^c

^a Department of Chemistry, Birzeit University, Ramallah, West Bank, Palestine

^b Department of Chemistry, Izmir Institute of Technology, Urla 35430, Izmir,
Turkey

^c Interface Analysis Centre, University of Bristol, 121 st. Michael's Hill, Bristol BS2 8BS,
United Kingdom

Abstract

Iron nanoparticles (Goethite) were produced using extracts of green tea leaves (GT-Fe NPs), also the Goethite particles synthesized in other novel procedure using anise extract in its preparation (A-G Ps). The materials were characterized using TEM, SEM/EDX, XPS, XRD, N₂-BET, and FTIR techniques, and were shown to contain mainly Goethite (iron oxo-hydroxide). The obtained particles (GT-Fe NPs, and A-G Ps) were then utilized as Fenton-Like catalyst in the degradation of Methylene Blue, Methyl Orange, and Malachite Green dyes. The related experiments investigated the removal kinetics and the effect of concentration for MB, MO, and MG. The concentrations of dyes in aqueous solution were monitored using ultraviolet-visible (UV-vis) spectroscopy. The results indicated fast removal of the dyes with the kinetic data of MB, and MG following a second order removal rate, while those of MO were closer to a first order removal rate. The loading experiments indicated almost complete removal of the dyes from water over a wide range of concentration, 10-200 mgL⁻¹. Also in studying the amount of Enthalpy change in the degradation of MG using A-G Ps, it found to be 22.5 kJol.mol⁻¹.

