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Name of the Scholar:	Iftkhar Ahmad
Name of the Supervisor:	Prof. Saiqa Ikram
Name of the Department:	Chemistry
Topic of the research:	In situ Deposition of Transition Metals on Functional Magnetic Nanocomposites for the Photocatalytic Degradation/Reduction of Organic Pollutants

Findings

The thesis titled **"In situ Deposition of Transition Metals on Functional Magnetic Nanocomposites for Photocatalytic Degradation/Reduction of Organic Pollutants"** encompasses seven chapters demarcating the synthesis and application of multifunctional heterogeneous nanocatalysts. These catalysts are meticulously crafted through the functionalization of magnetite with biopolymers, amino acids, and inorganic molecules such as SiO_2, succeeded by the deposition of transition metals onto their surfaces. The resultant nanocatalysts exhibit remarkable efficacy in the photocatalytic degradation and catalytic reduction of organic pollutants. The physicochemical characterization of the nanocatalysts is meticulously conducted employing a diverse array of analytical techniques including X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Brunauer–Emmett–Teller (BET) analysis, Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDX), and X-ray Photoelectron Spectroscopy (XPS). These sophisticated analyses yield profound insights into the structural and chemical properties of the catalysts, unraveling their intricate composition and morphology. Moreover, the kinetics of catalytic reactions are meticulously scrutinized utilizing pseudo-first-order kinetics, uncovering exceptionally high catalytic rate constants for the synthesized nanocatalysts. Notably, the reusability of these catalysts is methodically assessed, showcasing sustained catalytic activity even after multiple cycles, underscoring their exceptional stability and potential for practical applications in pollutant remediation.