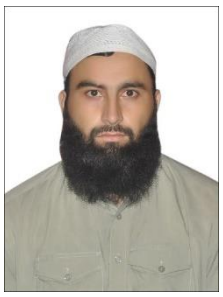
PhD Candidate Profile



Name:
Asfandyar Khan

Research Group (if relevant):
N/A

Research Centre (if relevant):
Inorganic Photochemistry

Department/School(s) (if relevant):
School of Chemical Engineering and Material Sciences

College:
University of Pannonia, Veszprém, Hungary

Supervisor(s):
Dr. Zsolt Valicsek, and Prof. Dr. Ottó Horváth

Funding body:
N/A

Area (field) of study:
Degradation of organic pollutants via heterogeneous photo-Fenton process

Thesis Title:
Photo-Fenton degradation of organic pollutants by the application of heterogeneous catalysts

Abstract:
Photo-Fenton process (PE-Fenton) is treated under Fenton conditions and simultaneously irradiated with visible/UV light to accelerate the removal efficiency of organics via photo-Fenton process. The UV irradiation will be provided by a 15 W low-pressure Hg lamp with a major emission at 254 nm. Fenton reaction based on Fe^{2+} -H_2O_2 system has been widely applied in water remediation, but the obvious drawbacks largely hinder its practical uses. Alternatively, heterogeneous nanomaterials with proper surface modification could be used as Fenton-like catalysts. Surface doping of iron could concentrate the pollutants surrounding the $CuFe_2O_4$ catalyst, which might benefit the catalytic performance of $CuFe_2O_4$. Herein, we reported that Fe doped $CuFe_2O_4$ nanoparticles (NPs) could be used as high-performance Fenton-like catalyst for dye degradation in near neutral environment, where the doping of Fe on $CuFe_2O_4$ surface dramatically improved the catalytic activity of $CuFe_2O_4$ in Fenton-like reaction. Iron doped $CuFe_2O_4$ NPs catalysed the decomposition of H_2O_2 to oxidize methylene blue without external energy supply, resulting in effective degradation. Fe doped $CuFe_2O_4$ NPs showed high catalytic activity under various pH values and even in the presence of radical scavenger. Higher concentration of catalysts and H_2O_2 would facilitate the

degradation efficiency. At higher temperature, the degradation became faster and more effective. The implication to the environmental applications of Fe doped $CuFe_2O_4$ NPs will be discussed. Then the NPs will be characterized by Raman, ICP, XRD, XRF, BET, TEM and SEM analytical techniques.

Collaborations:

N/A

Publications:

1. Khan, A.; Valicsek, Z.; Horváth, O. Synthesis, Characterization and Application of Iron(II) Doped Copper Ferrites ($Cu^{II}_{(x)}Fe^{II}_{(1-x)}Fe^{III}_2O_4$) as Novel Heterogeneous Photo-Fenton Catalysts. Nanomaterials 2020, 10, 921.
2. Khan, A.; Valicsek, Z.; Horváth, O. Synthesis of novel CuO, Fe_2O_3, and FeO nanoparticles via simple precipitation method and comparing their photocatalytic properties under photo-Fenton system. Under submission to Journal of Hazardous Materials.

Presentations:

1. WATER AND WASTEWATER TREATMENT IN THE INDUSTRY , International Scientific Conference 2019, Soós Ernő Water Technology Research and Development Center Zalakaros, Hungary. October 10, 2019, *Synthesis of novel $Cu^{II}O$, $Fe^{III}O$, and $Fe^{II}O$ nanoparticles via co-precipitation method and comparison of their photocatalytic properties.*
2. Day of Chemical Engineering-2019. University of Pannonia, Veszprem, Hungary. December 02, 2019. *Photochemical degradation of Rhodamine B under heterogeneous photo-Fenton system.*
3. Chemical Engineering Conference 2019. University of Pannonia, Veszprem, Hungary. April 18-19, 2019, Synthesis of novel heterogeneous photocatalysts and their application for the degradation of hazardous dyes.
4. Proceedings of the 4th World Congress on Civil, Structural, and Environmental Engineering (CSEE'19) Rome, Italy – April, 2019, Synthesis and photochemical reactions of iron(II) doped copper ferrites as heterogeneous catalysts.