INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Cavitation Assisted Hybrid Advanced Oxidation Processes for Degradation of Recalcitrant Pollutants**

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SHORT ABSTRACT

This thesis has demonstrated the efficacy of the cavitation (both ultrasonic and hydrodynamic) based hybrid advanced oxidation processes for enhanced degradation of organic pollutants. We have dealt with the pollutants from pharmaceuticals and pesticide industries. Various iron oxides were synthesized and characterized for Fenton like degradation reaction system. The process parameters and loading of additives were optimized to achieve the maximum degradation of pollutants. A kinetic model was proposed based on reaction network for homogeneous reaction system and experimental degradation profiles were analyzed vis-à-vis simulated profiles. Concurrent analysis of experiments and simulations revealed faster leaching of Fe^{2+} ions from surface of solid iron catalysts due to intense turbulence and shear generated in cavitating flow results in faster degradation. Results of this thesis also gives an insight into the inter-relation or inter-dependence among various design and operational parameters. Density functional theory (DFT) simulations were also performed to identify the vulnerable sites for the radical attack. DFT calculation was further employed to investigate the detailed degradation mechanism in $^{\bullet}OH$ mediated oxidative degradation of pollutants. Degradation intermediates were detected through LC-MS/MS analysis which was corroboration with DFT simulations. Present work has portrayed a systematic account of complex mechanisms and interactions in cavitation-based hybrid oxidation processes and further methodology could be extended to other studies involving hybrid advanced oxidation systems.