Designing of Nitrogen Doped Melamine Foam-Graphene-CNT-Metal Oxide Heterostructure Photocatalyst for Industrial Waste Management

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With the increase in population at large and meeting the demands in various sectors, management of industrial waste is a growing issue. Typically dye industries are excreting large quantities of hazardous chemical extracts which create severe ecological imbalance, especially contaminating water resources. Thus, it is inevitable to design cost effective, reusable and eco- friendly technology for sustainable development. Here, a facile approach has been adopted for the degradation of commonly used industrial dyes via renewable approach. The highly porous, chemically stable Mf-Gr-N-CNT matrix provides a proper anchoring template towards the immobilization of as-deposited SnO2 nanoparticles. This hetero-junction has effectively shown broadband absorption with significant delay for the recombination of photo generated excitons via suitable band alignment and thereby leading to 82% degradation of Eriochrome Black T (EBT) dye and the kinetics followed by pseudo first order reactions with a correlation constant of 0.96, under natural solar illuminations within a short period of time (90min @ 1L dye extract) as compared to its bare SnO2 counterpart. The biocompatibility of the degraded product has been effectively demonstrated through various biological assays and found that even in 800ug/ml dye concentration in presence of as-designed photocatalyst under natural light exposure does not affect the cell morphology as compared to the non-illuminated counterparts. Thus, this technology has a potential impact on industrial adoption aiming towards effective waste management.

Awards Won:
Second Award of $2,000
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $52,000 each)