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Heterogeneous Fenton-Like Catalytic Degradation of Remazol Brilliant Violet Dye Using Starch-Fe^0Nps-Silica Composite

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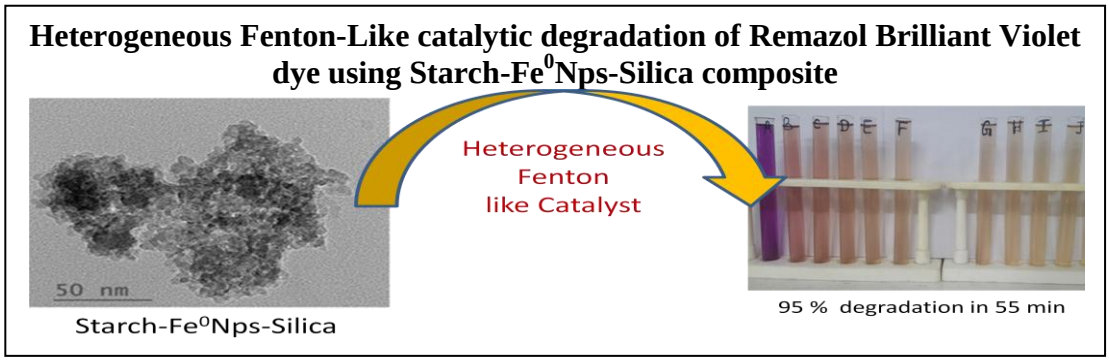
ABSTRACT

Fenton-like degradation of Remazol Brilliant Violet dye (RBV) has been carried out using Starch-Fe^0-Silica catalyst. A series of starch-zerovalent iron-silica composites (SFS_1 to SF_8) with different starch/Fe^0/silica ratios were prepared using an inexpensive and simplistic sol gel technique and mango leaf reduction strategy. In preliminary experiments SFS_1 showed optimum performance towards the dye degradation, therefore this sample was used for detailed characterization using HR-TEM, EDX, FE-SEM and FTIR techniques. The presence of starch and silica minimized the agglomeration of Fe^0 nanoparticles. The results of HR-TEM study showed that SFS_1 has spherical Fe^0 nanoparticles of approx. 4 nm average size. The dye degradation was initially fast and 79 % dye was degraded from 100 mg L^{-1} dye solution using 0.05 g of catalyst dose, in first five min. As the time passed the degradation eventually slowed down and almost 90% dye was degraded within 55 min. The degradation kinetic data obeyed pseudo first order kinetic model with rate constant 0.03224 min^{-1}. The catalyst performed efficiently well over a *wide range of dye concentrations (25-200 mg L^{-1}).The catalytic efficiency of St-Fe^0-Si remained significant up to four repetitive cycles, that evidenced its strong catalytic potential.*

Graphical Abstract



Keywords: Fenton-like catalytic degradation, Remazol Brilliant Violet dye (RBV), Starch-Fe^0Nps-Silica Composite.