Abstract:

With the increasing concentration of antibiotics in aquatic environment due to over usage of antibiotics, it has now become the matter of concern to take proper measures for the removal of antibiotics from wastewater. Out of several methods of wastewater treatment Advanced Oxidation Processes are the most prevailing one. These are very effective in removal of organic pollutants from wastewater. Nanotechnology is growing very rapidly day by day. Nanoparticles of metal oxides are having applications in almost every field of life. This study focuses however on the application of Hematite (α-Fe_2O_3) nanoparticles in the treatment of wastewater for the degradation of ciprofloxacin. α-Fe_2O_3 and its doped nanocomposites i.e. Ni/ α-Fe_2O_3, Co/ α-Fe_2O_3, Mn/ α-Fe_2O_3, Ni/Co/ α-Fe_2O_3 and Ni/Co/Mn/ α-Fe_2O_3 were evaluated for their photocatalytic activity to degrade the ciprofloxacin under direct sunlight. pH of the solution was kept at 7.0. By UV/Visible spectrophotometry the rate of degradation of the ciprofloxacin was measured. Ciprofloxacin itself degraded to almost 32.12% while by using an efficient photocatalyst increased the %degradation of ciprofloxacin. Of all the photocatalysts evaluated in this study simple hematite nanoparticles came out the most efficient as it degraded almost 65% drug within 120mintes. However doping also caused some significant effect on the photocatalytic activity of the hematite nanoparticles. Tri-metallic doped α-Fe_2O_3 showed promising results as it degraded 50% drug in much less time as compared to undoped α-Fe_2O_3 nanoparticles. These nanoparticles exhibited promising photocatalytic activity and hence, can be used effectively for environmental remediation. Further GC-MS technique was also used for the determination of possible degradation pathway for the degradation of ciprofloxacin.