Shaped Porous Iron Oxide based Semiconductor: Efficient Visible Light Photocatalyst for Organic Pollutant Degradation

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1. **Introduction –** The extensively studied iron oxide (α-Fe_2O_3) is excellent candidates due to their non-toxic, naturally abundant, less-costly and environment friendly nature. Thus this materials have potential to be applied in wide range of applicative purposes. However the practical applications of these materials are quite limited due to poor visible light energy conversion efficiency.[1] With the above ideas borne in mind, synthesis of porous iron oxide based photocatalysts with tuned properties (in terms of morphology, porosity, surface oxidation states, magnetic properties, optical properties) has been explored. In this context the use of dopant can be quite fruitful. There are various reports on cationic doping [2] but the study on the effect of anionic is limited. The effect of chloride doping in the most common iron oxide phases- α-Fe_2O_3 has been considered. To the best of our knowledge we are the first to report chloride ion doping onto α-Fe_2O_3 nanoparticles and its effect on the capability of exploitation of visible light spectrum.

2. **Experimental –** The porous nanomaterials were prepared by a simple hydrothermal route. The different reaction temperatures were used for catalyst synthesis *viz.* 150ºC, 165 ºC and 180 ºC. $FeCl_3$ was used as Fe precursor.

The photocatalytic efficiency of the photocatalysts was monitored by its ability to degrade harmful dyes- cationic and anionic under irradiation of low power 14W LED lamp source in presence of an oxidant, H_2O_2.

3. **Results and Discussion** –The synthesized semiconductors were characterized by various instrumental techniques. Variation of reaction temperature provides in formation of nanostructures with tuned morphology and porosity. It is found that photocatalysts are much more effective in degradation of cationic dyes. Furthermore, investigation regarding the degradation efficiency of the photocatalyst on cationic dyes with different structure of chromophoric groups, was performed. Thus, the investigation was accomplished with triarylmethane (Crystal violet), Xanthene (Rhodamine B), heteroatom containing polyaromatic hydrocarbon (Methylene blue). The effect of dye concentration, photocatalyst dosage and the duration of time for light irradiation, were also explored.

4. **Conclusions -** The effect of chloride doping has been investigated. The morphology, porosity, surface oxidation states, presence of defects has marked influence on the performance of photocatalytic degradation.

5. References

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Acknowledgement: Dr. M. Roy gratefully acknowledges the financial support from the Department of Science and Technology under the SERB-NPDF sponsored project scheme, (Project No. PDF/2017/000390) for undergoing the above research work