

SUMMARY

In the present work, various metal oxide and metal sulfide NPs (ZrO_2 , CuO , CuS) were synthesized by using simple, fast, efficient and green chemical technique. The synthesized NPs were characterized by various techniques. As fabricated NPs were utilized as catalyst for organic transformation, dye degradation and electrochemical sensing.

Xanthenes and dihydropyrimidinone have attracted lot of interest in pharmaceutical industry. The synthesized NPs are proven to be excellent heterogeneous catalyst in synthesis of xanthenes and dihydropyrimidinone due to their high surface to ratio volume. All the three NPs showed excellent recyclability without much loss in activity till fourth cycle. CuS NPs have been employed as a catalyst in the synthesis of dihydropyrimidinone with varied substitution pattern using MW under solvent free conditions. Mechanistic and kinetic studies have also been performed.

All the three NPs were used as photocatalyst and sonocatalyst for degradation of direct red dye and victoria blue dye. All three NPs proved as good sonocatalyst and photocatalyst and showed first order kinetics. In case of photocatalysis the k value of ZrO_2 NPs came out to be maximum, therefore ZrO_2 NPs proved to be best as photocatalyst out of three NPs. In case of sonocatalysis k value for CuS NPs is maximum which prove CuS NPs as excellent sonocatalyst. In the present course work, ZrO_2 NPs modified gold electrodes were used for sensing of catechol and hydrazine. Catechol and hydrazine were detected in aqueous solution for environmental applications. The amperometric method was used to detect the sensitivity. The developed system exhibit good sensitivity, reproducibility and stability.