ABSTRACT

Due to industrialization, the VOCs are contaminating both air and water bodies which are a cause of concern due to their health hazards. In the recent year use of noble metal catalyst to destroy VOCs on site has gained importance. However their cost deters their use. We have developed low cost transition metal oxide catalysts such as CuO, Co₃O₄ and their composites (Co₃O₄/CuO) to be used as oxidation catalysts for VOCs. The processes used have been Hydrothermal (HT), Sol-Gel Autocombustion (SGA), Chemical Combustion (CC) Thermal Decomposition (TD), for the production of high surface area, and enhanced catalytic activity of nano structural catalysts (in the range of 16 nm to 71 nm). The synthesized catalysts were studied for the relative oxidation of formaldehyde by aqueous potassium dichromate and respective catalyst, at moderate temperatures (20-40°C). Co₃O₄ being best has been used to catalyze the oxidation of oxalic acid and benzaldehyde by air/oxygen at moderate temperatures (25°-65°C) and (60°C) respectively. As no reagents were employed for the oxidation of oxalic acid and benzaldehyde, the heterogeneous nature, reusability and recoverability of Co₃O₄ catalyst makes the process a truly Green Technology at lower costs.

We have also successfully sealed up the production process for the catalyst i.e. Co₃O₄ for batches of 1000gm to 5000gm; thus making the process workable and catalyst available.

The structures of the catalysts produced have been ascertained by the use of FTIR, XRD and TEM. The particles of CuO produced by the either process are monoclinic and that of Co₃O₄ are spinel: whereas the mixed morphology has been observed for the composites of CuO/Co₃O₄ produced by either of the process i.e chemical combustion, sol-gel autocombustion, hydrothermal and thermal decomposition.