19CH201 – ENGINEERING CHEMISTRY FOR CIRCUIT BRANCHES
Unit-3 NANO CHEMISTRY

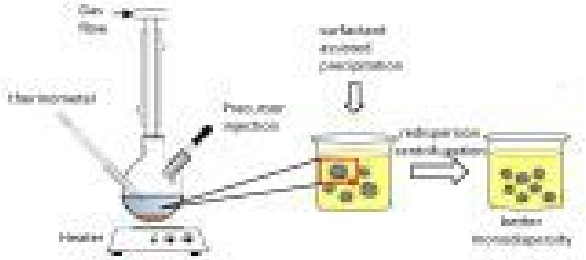
SYNTHESIS OF NANOPARTICLES
PRECIPITATION METHOD

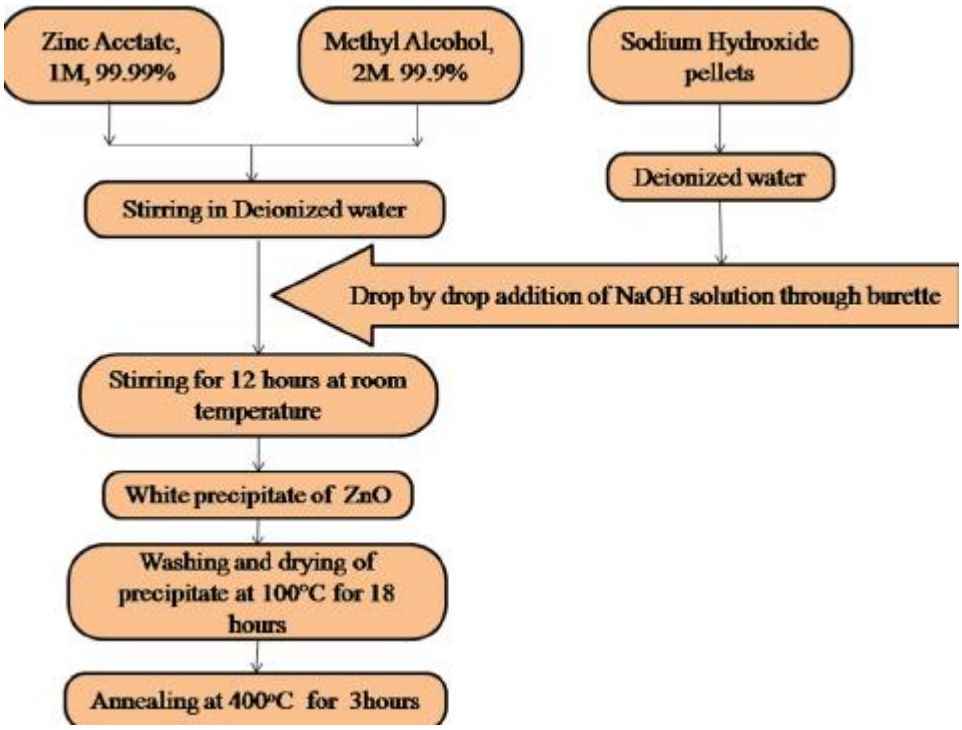
Preparation of $BaSO_4$ Nanoparticles

Nanoparticles of barium sulphate ($BaSO_4$) have been synthesized from barium nitrate by precipitation method in the presence of water soluble organic polycarboxylic polymer as a modifying agent.

50 mL 0.1 M $Ba(NO_3)_2$ was added to 50 mL 0.1M $(MH_4)_2SO_4$ in the presence of water soluble organic polymers as modifier agent. The solution was added drogpwise into the flask while stirring at room temperature with dispersant at strong mechanical stirring 2000-2500 rpm.

The steady drop rate was 20 drops min-1. Gelatinous white precipitates were formed instantly. The precipitates were separated from the mother liquid by centrifuged at 3000 rpm for 20 min. and then the supernatant solution was discharged and the solid was redispersed in deionized water. This process was repeated three times in order to rinse the particles. After the last centrifugation, sedimented particles were dried in the microwave oven. The products were slightly grinded for analysis.





Thermolysis

Thermolysis method involving the decomposition of organo metallic precursors in high boiling organic solvents. If one starts with a precursor complex wherein the ligand bind to the metal ions through oxygen, it could be possible to envisage a decomposition reaction that would leave behind the metal oxide.

For a trivalent ion, such reactions could be generalized as:

$(R\text{-}O)_3 - M^{3+} \rightarrow M_2O_3 +$ Leaving group

Suitable design of the R group (stable leaving groups) would ensure that the reaction proceeds in a facile manner. It should then be possible to carry out such reactions in a suitable high temperature solvent under solvothermal conditions, possibly in the presence of a suitable capping agent.

Cupferron (N-phenyl, N-nitroso hydroxylamine) forms bidentate, univalent complexes with a number of different transition metals ions. These complexes

easily decompose to give the oxide. Fe_2O_3, Cu_2O and Mn_3O_4 nanoparticles prepared by injecting octylamine solutions of the corresponding cupferron precursors into refluxing trioctylamine. Size is controlled by controlling the temperature of the reaction. The particles so prepared form stable solutions in solvents such as toluene, from which they can be reprecipitated by the addition of methanol.