



19CH103- ENGINEERING CHEMISTRY

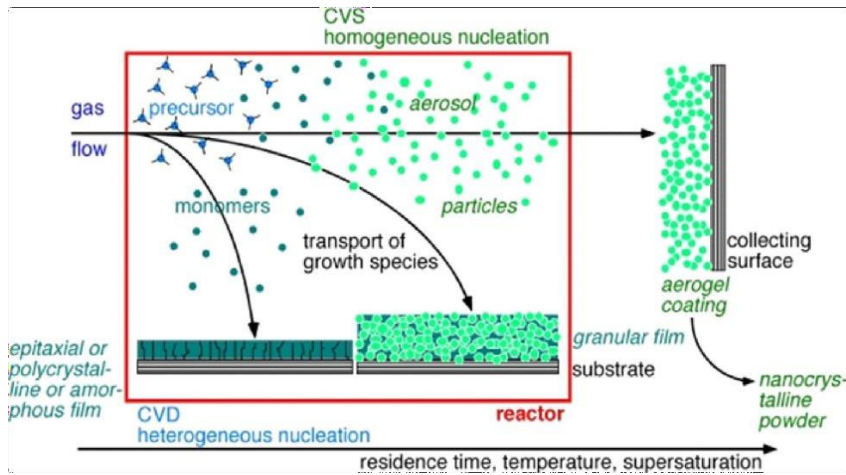
Unit-3 NANOCHEMISTRY

Chemical vapour deposition

Chemical Vapor Synthesis (CVS) is a modified Chemical Vapor Deposition (CVD) method where the process parameters are adjusted to form nanoparticles instead of film. The entire range of reaction regimes and corresponding microstructures (epitaxial, polycrystalline, columnar, granular films and aerogel coatings as well as nanopowders) are shown in the below.

Both in CVD and CVS, precursors are metalorganics, carbonyls, hydrides, chlorides and other volatile compounds in gaseous, liquid or solid state. The major limitation of the CVS process is the availability of appropriate precursor materials. The energy for the conversion of the reactants into nanoparticles is supplied in hot wall (external furnace), flame (reaction enthalpy), plasma (microwave or radio frequency) and laser (photolysis or pyrolysis) reactors.

The most important process parameters determining the quality and usability of the nanopowders are the total pressure (typical range from 100 to 100000 Pa), the precursor material (decomposition kinetics and ligands determining the impurity level), the partial pressure of the precursor (determining the production rate and particle size), the temperature or power of the energy source, the carrier gas (mass flow determining the residence time) and the reactor geometry.



The nanoparticles are extracted from the aerosol by means of filters, thermophoretic collectors, electrostatic precipitators or scrubbing in a liquid. Modifications of the precursor delivery system and the reaction zone allow the synthesis of pure oxides, doped oxides, coated nanoparticles, functionalized nanoparticles and granular films.

