



## 19CH201 – ENGINEERING CHEMISTRY FOR CIRCUIT BRANCHES

### Unit-3 NANO CHEMISTRY

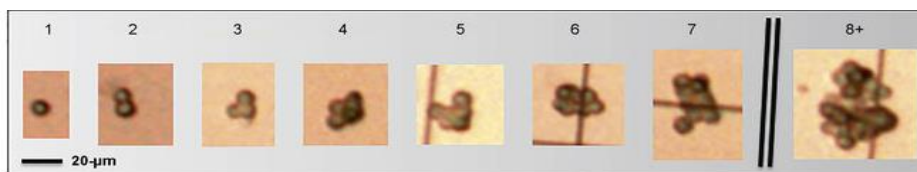
#### NANO CLUSTERS AND NANO RODS

Nanoclusters constitute an intermediate state of matter between molecules and solids. Nanocluster sizes range from sub-nanometer to about 10 nanometres in diameter and are of technological interest in numerous areas of applied science (e.g. materials science, catalysis).

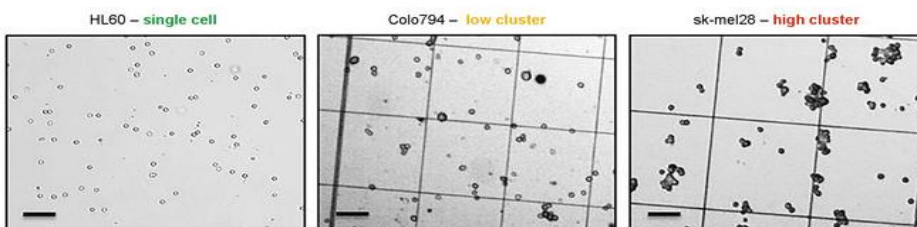
Nanoclusters, however, have properties and structures which are very sensitive to their composition and size (i.e. “every atom counts”) which can lead to new and interesting properties not realized in the corresponding bulk material.

#### Production of nano clusters

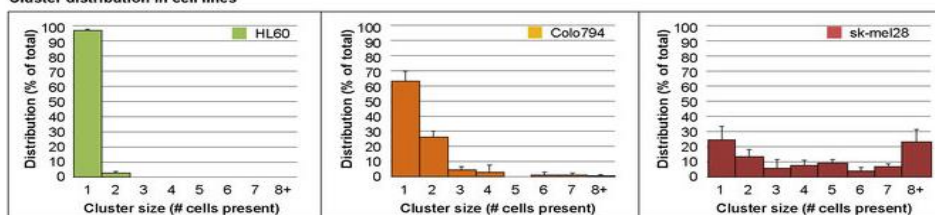
Clusters can be prepared from atomic or molecular constituents or from the bulk materials. Molecular clusters or atomic clusters are formed by nucleation of molecules or atoms respectively.



Nanocluster  
size



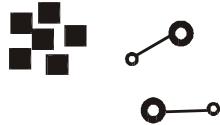
Cluster distribution in cell lines





## Atomic clusters

Atoms



Bulk

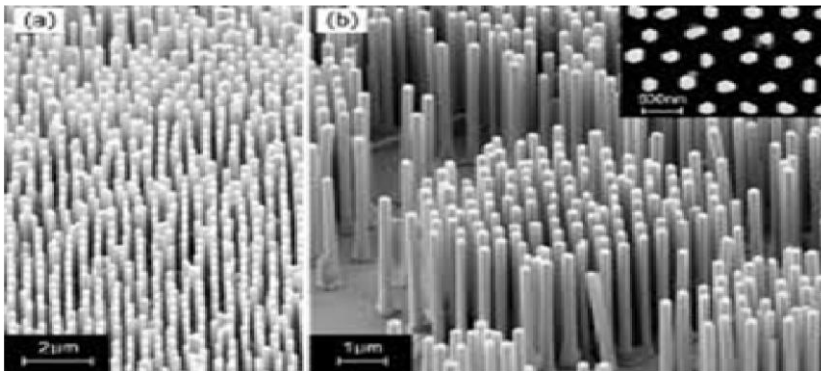
Production of nano clusters from atoms or molecules or from bulk materials

## NANO ROD

Nanostructures shaped like long sticks or dowels with a diameter in the nanoscale but having a length that is very much longer.

### *Description*

- In nanotechnology, nanorods are one morphology of nanoscale objects. Each of their dimensions range from 1–100nm. They may be synthesized from metals or semiconducting materials. Standard aspect ratios (length divided by width) are 3-5.
- Nanorods are produced by direct chemical synthesis. A combination of {ligands} act as shape control agents and bond to different facets of the nanorod with different strengths. This allows different faces of the nanorod to grow at different rates producing an elongated object.



Nano rod



## Applications

The applications of nanorods are diverse, ranging from display technologies (the reflectivity of the rods can be changed by changing their orientation with an applied electric field) to microelectromechanical systems (MEMS), optical, sensing, solar cells, magnetic, and electronic device applications.