



## 19CH201 – ENGINEERING CHEMISTRY FOR CIRCUIT BRANCHES

### Unit-3 NANO CHEMISTRY

#### APPLICATIONS OF NANOPARTICLES

##### 1. Energy storage

- Nanoparticles are used hydrogen storage.
- Nano particles are used in magnetic refrigeration.
- Metal nanoparticles are useful in fabrication of ionic batteries.

##### 2. Nanoparticles applications in manufacturing and Materials

- Silicate nanoparticles can be used to provide a barrier to gasses (for example oxygen), or moisture in a plastic film used for packaging. This could slow down the process of spoiling or drying out in food.
- Zinc oxide nanoparticles can be dispersed in industrial coatings to protect wood, plastic, and textiles from exposure to UV rays.
- Silicon dioxide crystalline nanoparticles can be used to fill gaps between carbon fibers, thereby strengthening tennis racquets.
- Silver nanoparticles in fabric are used to kill bacteria, making clothing odour-resistant.

##### 3. Nanoparticles applications in Energy and Electronics

- Silicon nanoparticles coating anodes of lithium-ion batteries can increase battery power and reduce recharge time.
- Semiconductor nanoparticles are being applied in a low temperature printing process that enables the manufacture of low cost solar cells.
- A layer of closely spaced palladium nanoparticles is being used in a hydrogen sensor. When hydrogen is absorbed, the palladium nanoparticles swell, causing shorts between nanoparticles. These shorts lower the resistance of the palladium layer.

##### 4. Nanoparticles applications in Environment

- Researchers are using gold nanoparticles embedded in a porous manganese



oxide as a room temperature catalyst to breakdown volatile organic pollutants in air.

- Iron nanoparticles are being used to clean up carbon tetrachloride pollution in ground water.
- Iron oxide nanoparticles are being used to clean arsenic from water wells.

## 5. Other Applications

- Nanoparticles could be engineered and used for anti-reflection product coatings, producing a refractive index for various surfaces, and also providing light based sensors for use in diagnosing cancer.