



# **SNS COLLEGE OF TECHNOLOGY**

Vazhiampalayam, Coimbatore-35

**(An Autonomous institution)**

Accredited by **NBA-AICTE** and Re-Accredited by **NAAC-UGC with A+ Grade**

Approved by **AICTE**, New Delhi & Affiliated to **Anna University**, Chennai

## **DEPARTMENT OF CHEMISTRY**

**COURSE NAME : 23CHT101- ENGINEERING CHEMISTRY**

**I YEAR / I SEMESTER**

**UNIT : 3. NANOMATERIALS**

**TOPIC : 2. SOL GEL METHOD**





# WHY SOL GEL METHOD?

- Bottom up method
- Extended composition range
- Better homogeneity
- Less energy consumption
- Economical method



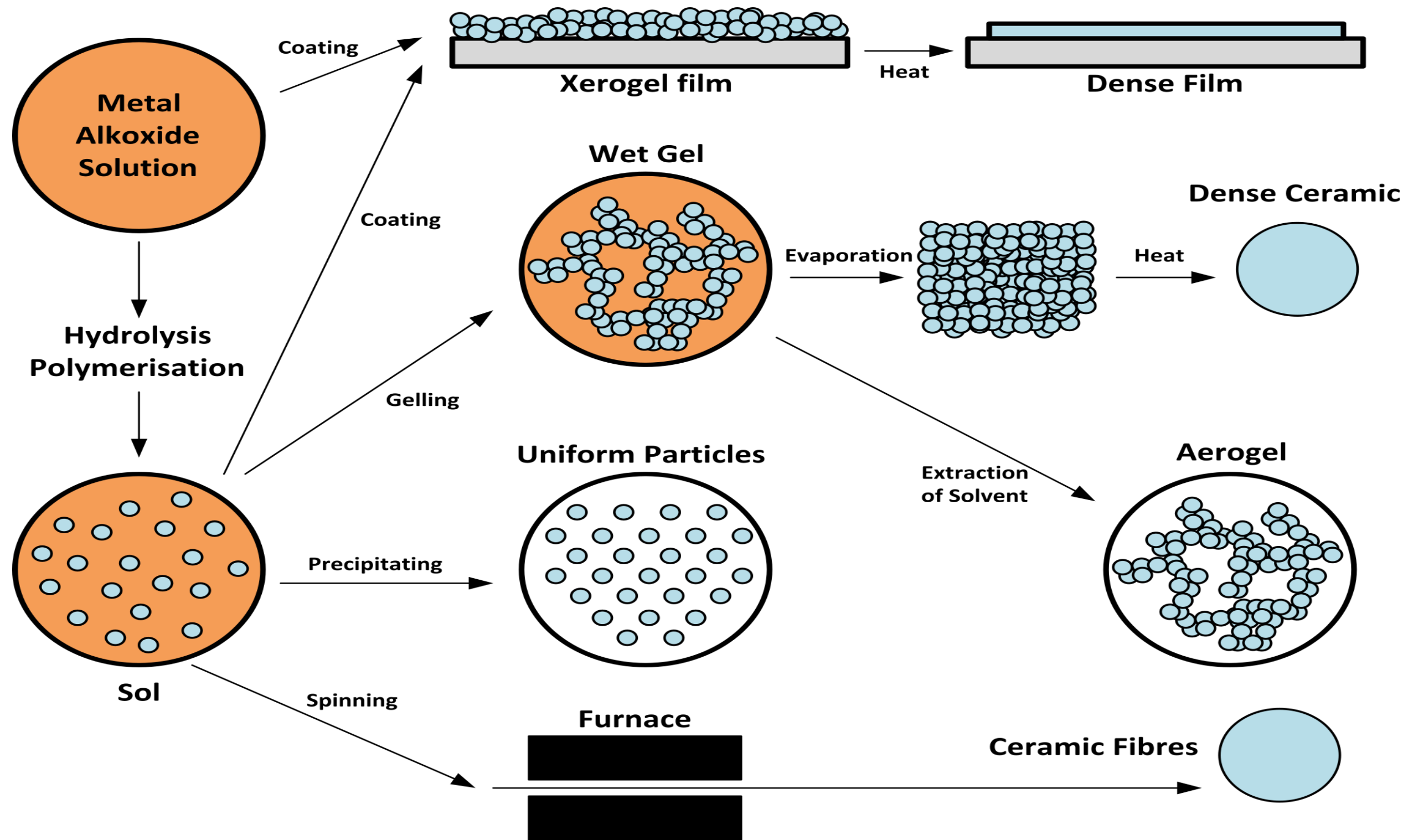
Sol



Gel



# SCHEMATIC REPRESENTATION OF PROCESS

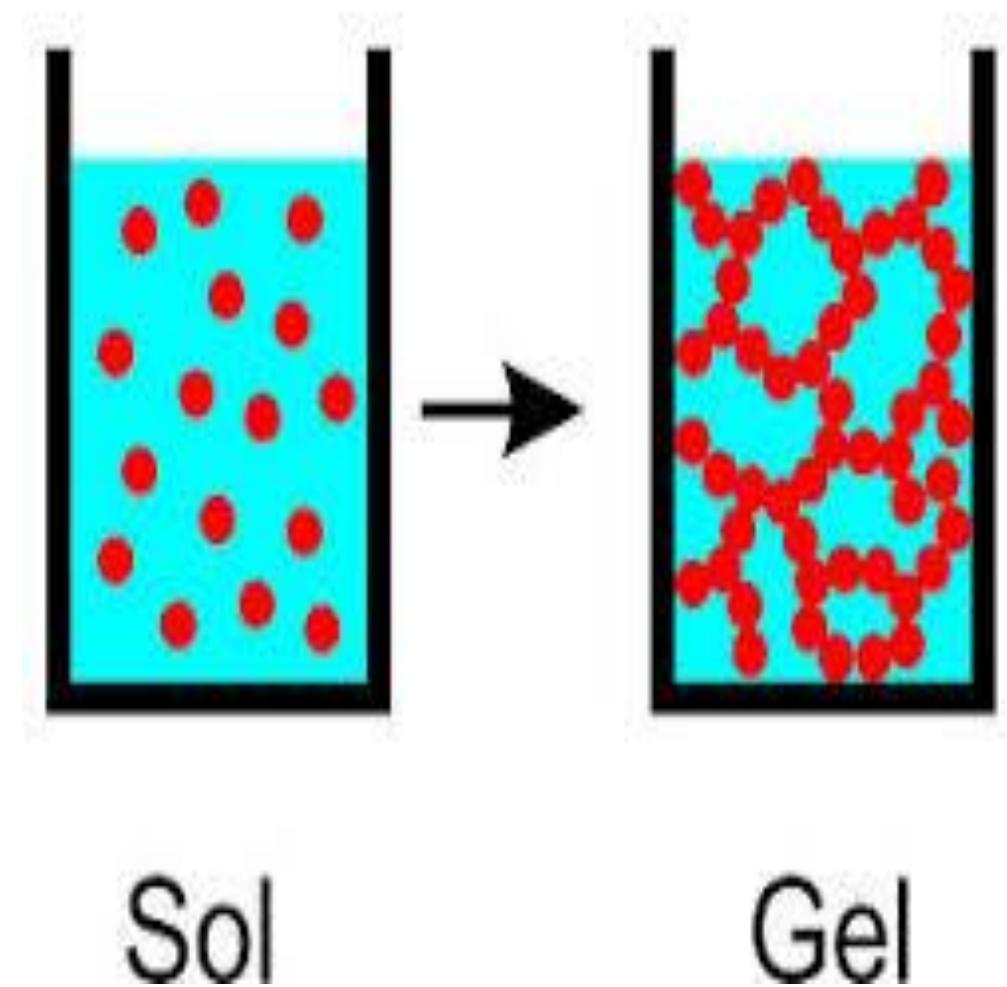




# PROCESS



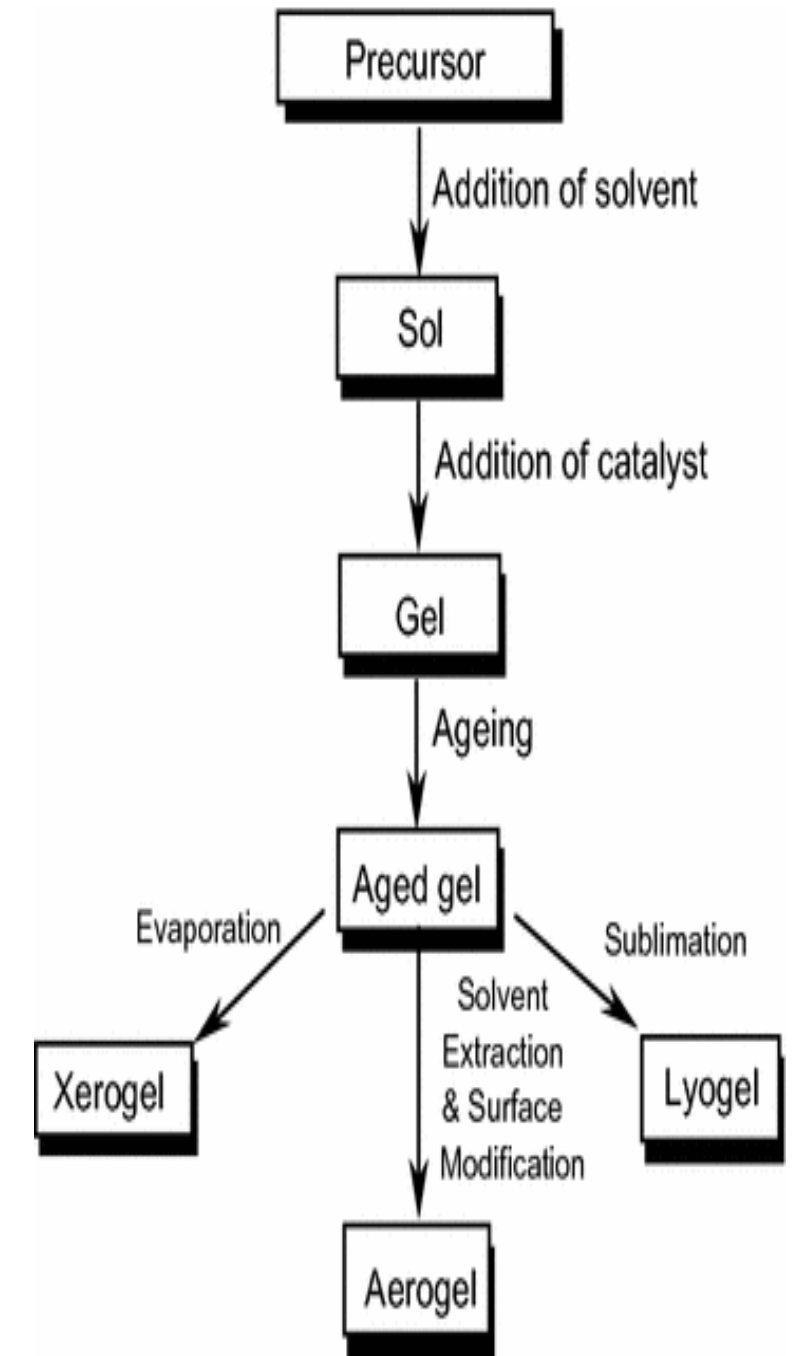
- Sol-gel is a chemical solution process used to make ceramic and glass materials in the form of thin films, fibers or powders .
- A sol is (a colloidal or molecular suspension) obtained from (starting materials) .
- A gel is a semi-rigid mass that forms when the solvent from the sol begins to evaporate and the particles or ions left behind begin to join together in a continuous network





# PROCESS

- The sol-gel process is a wet-chemical technique that uses either a chemical solution (sol short for solution) or colloidal particles (sol for nanoscale particle) to produce an integrated network (gel).
- Metal alkoxides and metal chlorides are typical precursors. They undergo hydrolysis and polycondensation reactions to form a colloid, a system composed of nanoparticles dispersed in a solvent. The sol evolves then towards the formation of an inorganic continuous network containing a liquid phase (gel)

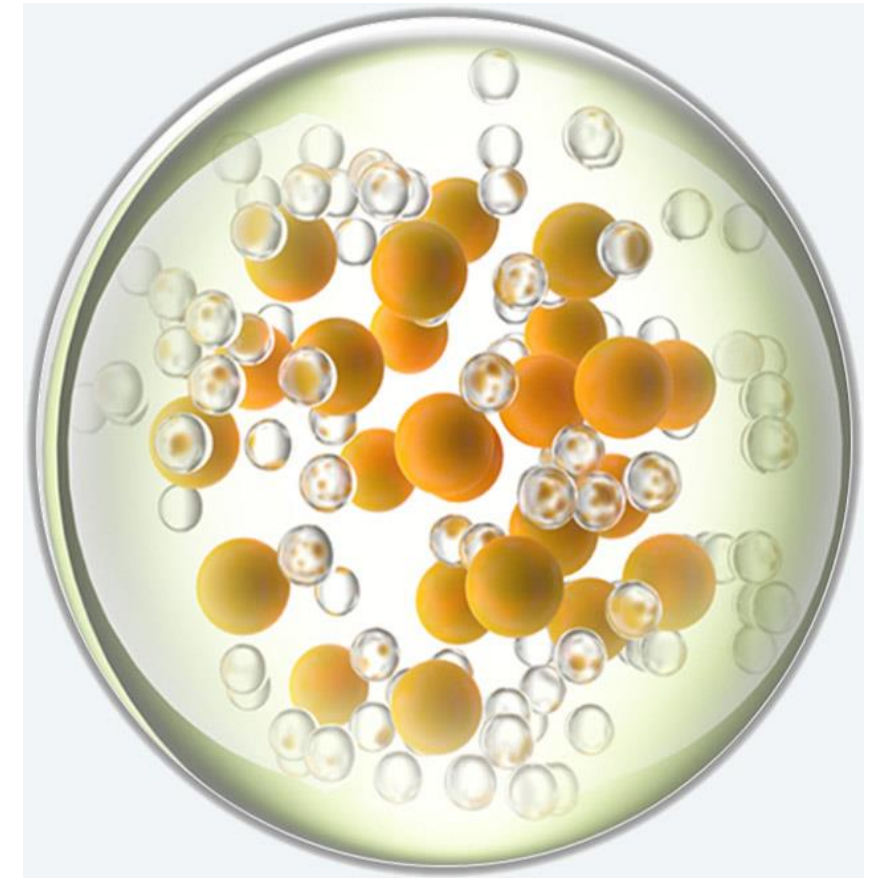




# PROCESS



- Formation of a metal oxide involves connecting the metal centers with oxo (M-O-M) or hydroxo (M-OH-M) bridges, therefore generating **metal-oxo or metal-hydroxo polymers** in solution.
- After a drying process, the liquid phase is removed from the gel. Then, a thermal treatment (**calcination**) may be performed in order to favor further poly condensation and enhance mechanical properties



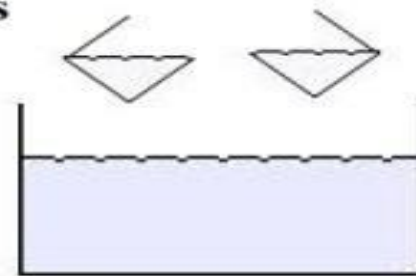


# Quiz time



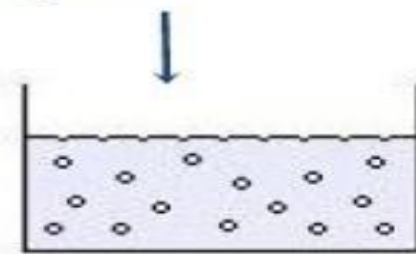
# REACTIONS

Mix reactives

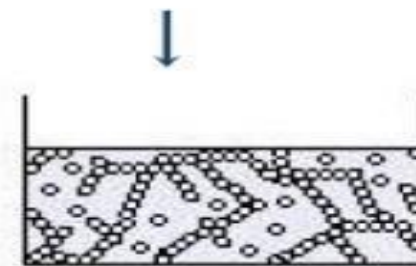


Hydrolysis and Condensation reactions take place

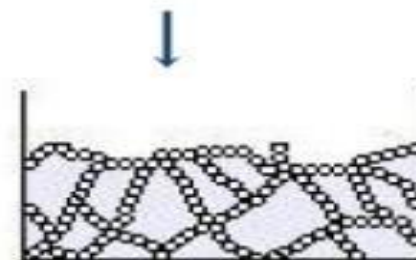
Sol



Gelification



Gel



Hydrolysis



Condensation







# PICTORIAL REPRESENTATION OF PROCESS



**Sol**



**Gel**



**Dried gels**



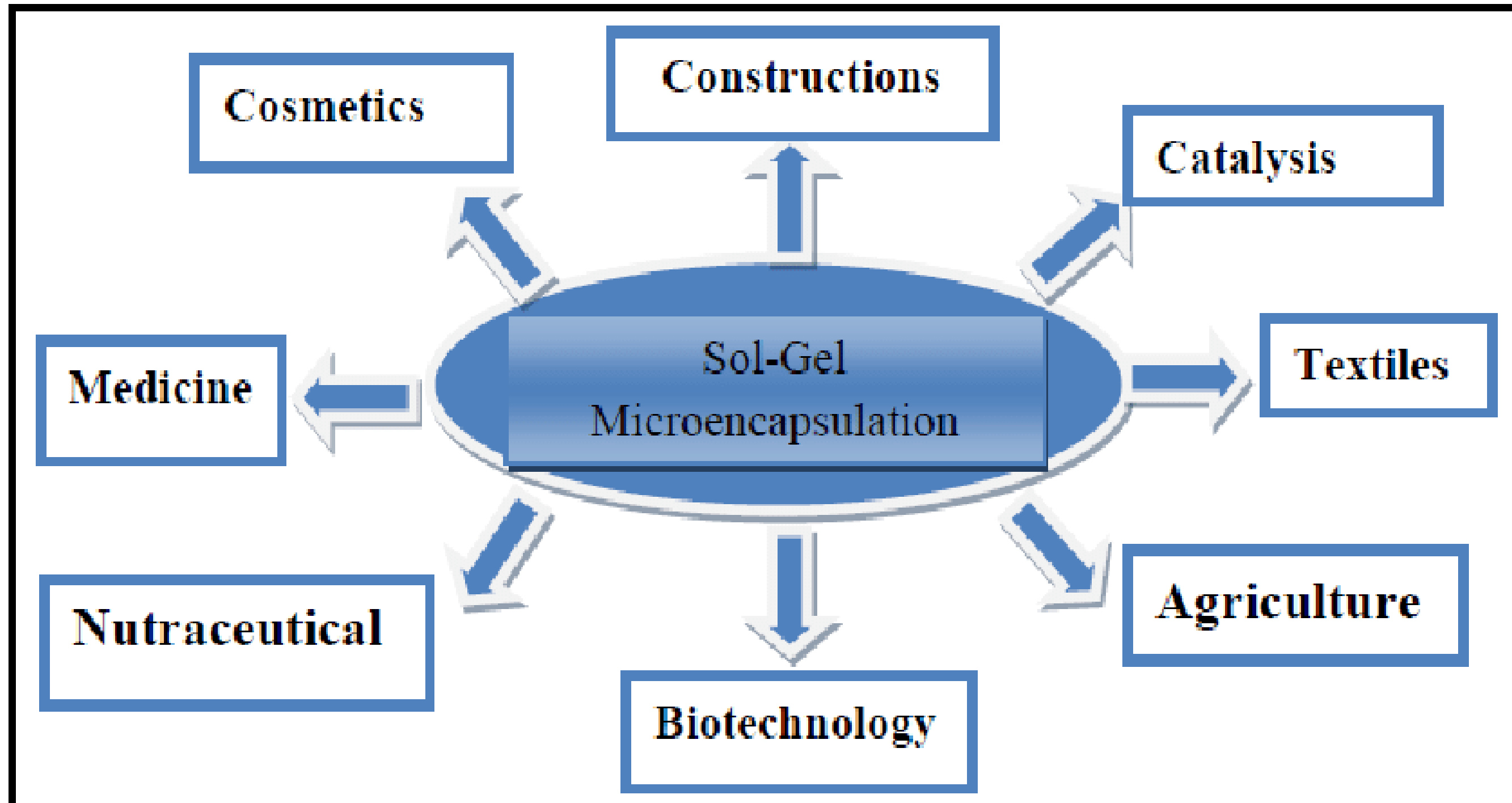
**Grinding**



**Sifting**



# APPLICATIONS OF SOL GEL METHOD





# ASSESSMENT



1. List out the various stages of gel formation
2. List out any two nanoparticles prepared by sol gel method



# SUMMARY



# REFERENCES



1. Dr.V.Veeraiyan, “Engineering Chemistry-II ”VRB Pub. Co. Ltd, Chennai.2016..
2. Wiley, “Engineering Chemistry”, John Wiley & Sons. InC, USA.
3. P.C.Jain & Monicka Jain, “Engineering Chemistry” , Dhanapat Rai Publising Company Pvt. Ltd. 2017.

**THANK YOU**