



# **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 : 19CHB101- CHEMISTRY FOR ENGINEERS**

**I YEAR / I SEMESTER**

**UNIT : 2. NANOCHEMISTRY**

**TOPIC : 2. SOL GEL METHOD**



# WHY SOL GEL METHOD?

- Bottom up method
- Better homogeneity
- Less energy consumption
- Economical method



Sol



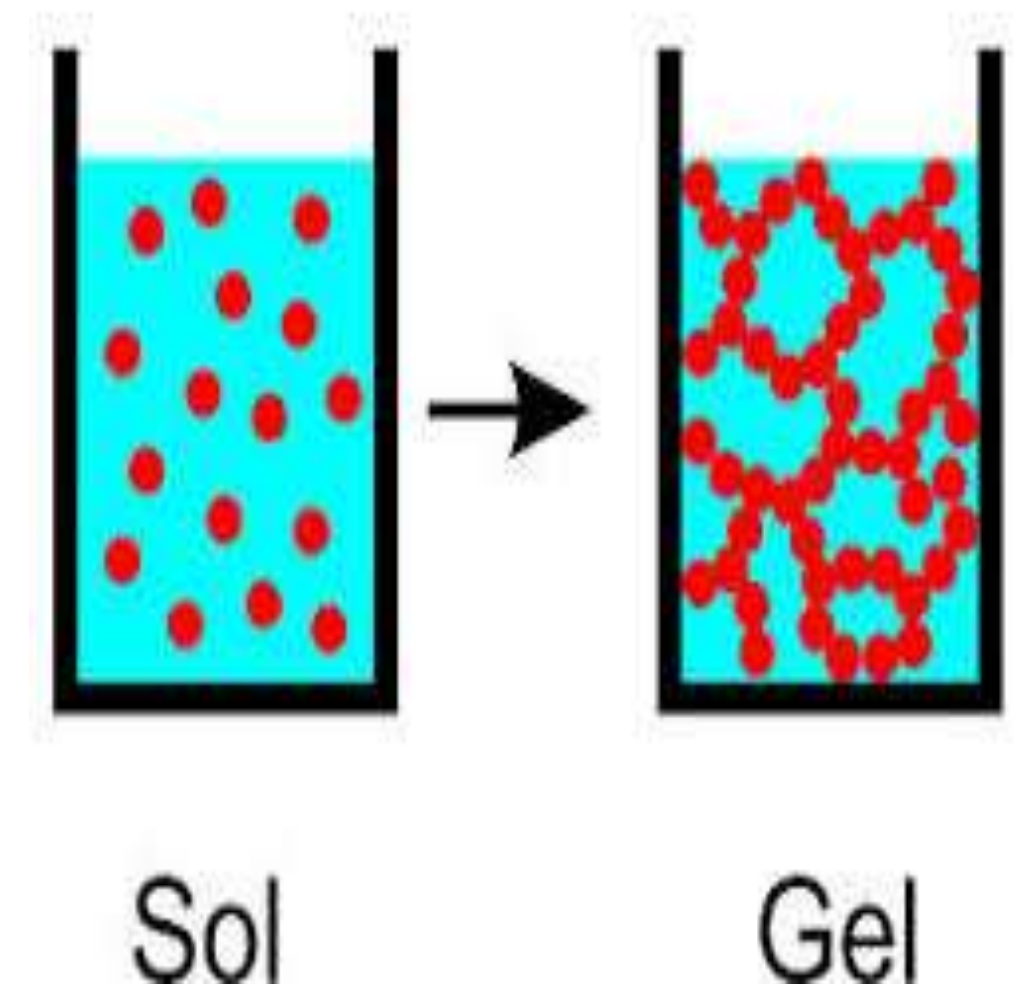
Gel



# 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





## SOL-GEL METHOD CONSISTS SEVERAL STEPS

1) SOL FORMATION: Hydrolysis of metal organic reactant in an organic solvent that is miscible with water or inorganic salts in water results in formation of sol



2) GEL FORMATION: Condensation followed by polycondensation of sol results in the formation of the gel.

Water condensation: hydrolysed species condense releasing water.



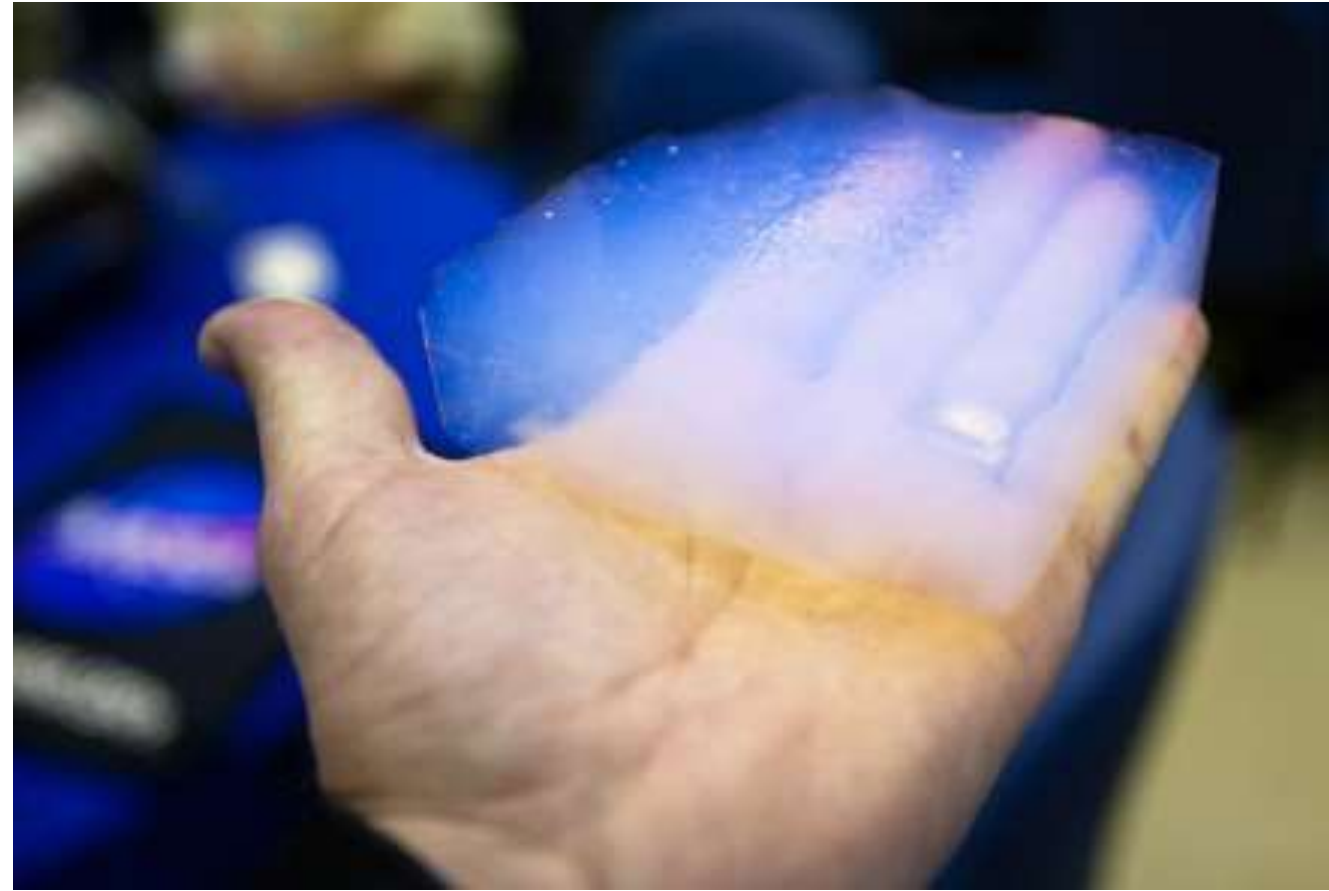
Alcohol condensation: Hydrolysed species condense with unhydrolyzed species releasing alcohol.



Aging of gel during which polycondensation reaction occurs, can exceed 7 days is critical to the prevention of cracks in gels that have been cast.



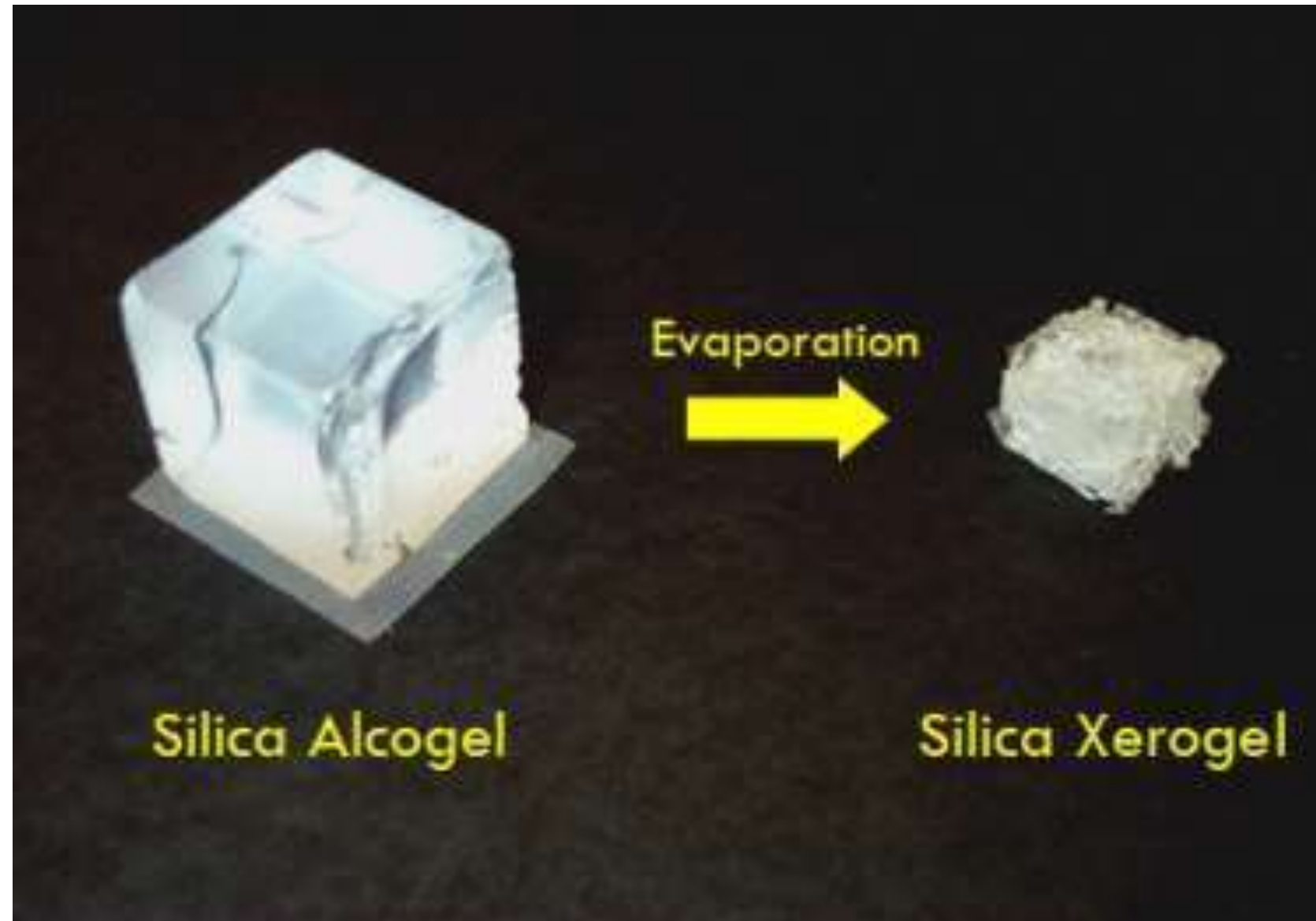
3) DRYING: It is nothing but removal of pore liquid



Under hyper critical conditions, upon drying the network does not collapse and the aerogels are formed.



# Xerogel



Under ambient condition, upon thermal evaporation, shrinking of pores occurs and the xerogels are formed.



4) **CALCINATION**: During calcination, xerogel is heated up to 800 c. The pores of gel network are collapsed and remaining organic species are volatilized. The surface bound M-OH groups are removed, there by stabilizing the gel against rehydration. Calcination results in densification and decomposition of the gel.

5) **HEAT TREATMENT**: By heat treatment the material is shaped in to desired form such as films, fibres and nano sized powder. Subsequently it can be converted into Ceramic material.



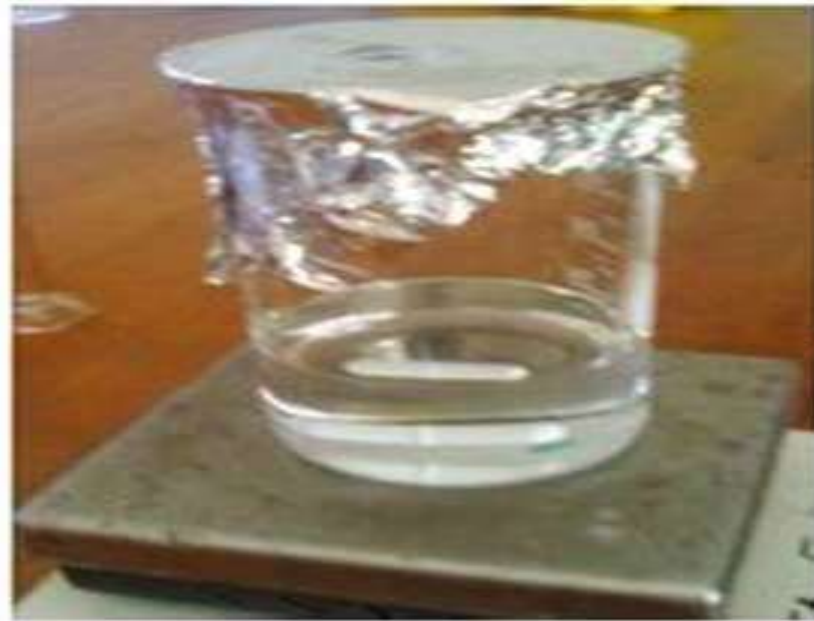


# Quiz time





# PICTORIAL REPRESENTATION OF PROCESS



**Sol**



**Gel**



**Dried gels**



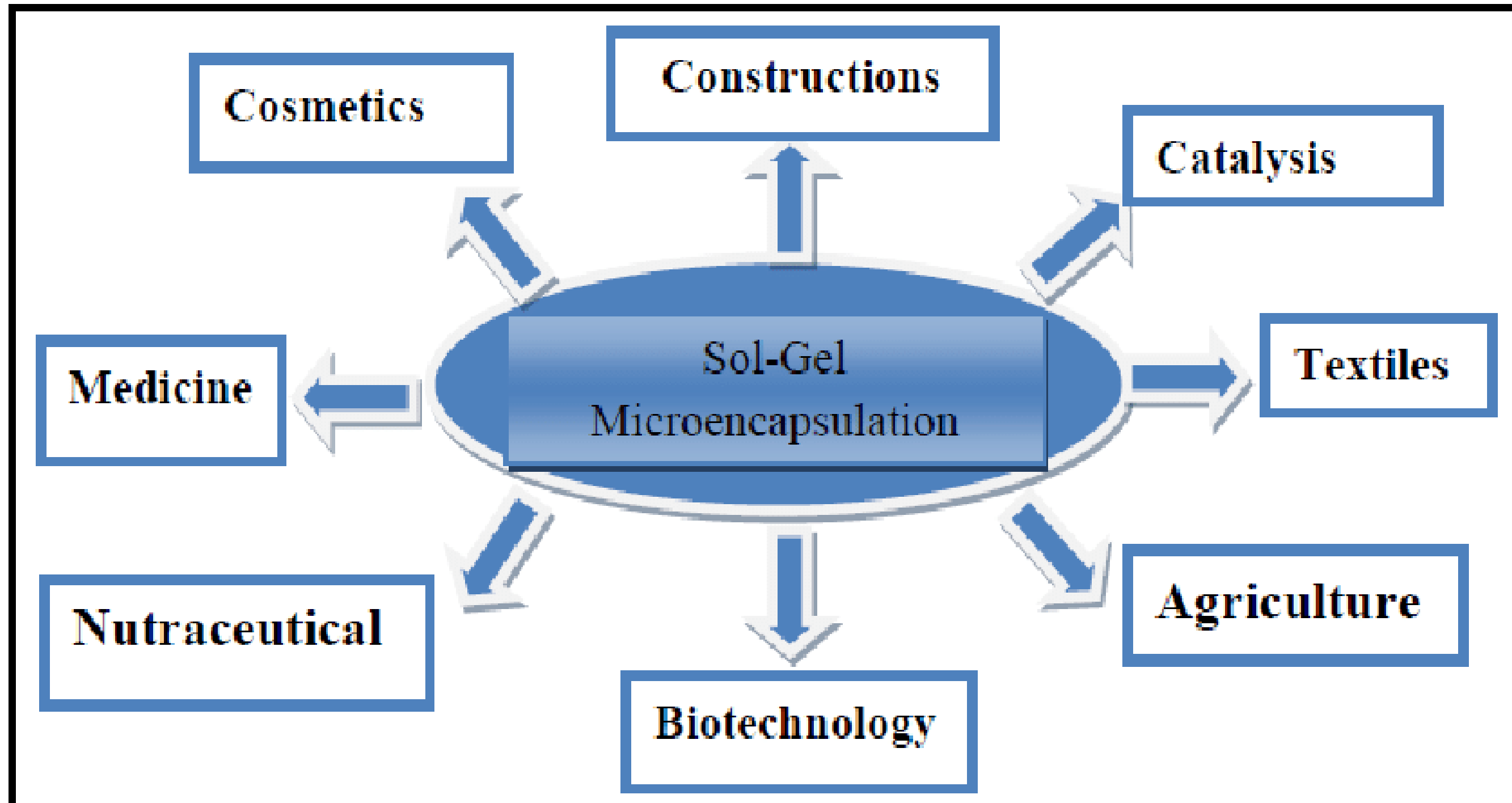
**Sifting**



**Grinding**



# APPLICATIONS OF 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**