



## 19CH101- ENGINEERING CHEMISTRY

### Unit-1 WATER AND ITS TREATMENT

#### ZEOLITE PROCESS

##### Zeolite

Zeolite is hydrated sodium aluminum silicate. Its chemical formula is  $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot \text{XSiO}_2 \cdot \text{YH}_2\text{O}$  (where  $\text{X}=2-10$  and  $\text{Y}=2-6$ )

It is represented as  $\text{Na}_2\text{Ze}$ , which is capable of exchanging reversibly its Na ions for hardness producing ions in water. It is also known as Permutit.

##### Classification

They are classified into two types

- (a). Natural zeolites
- (b). Synthetic zeolites

##### Natural zeolites

Natural zeolites are derived from *greensand*. They are non-porous zeolites.

Example

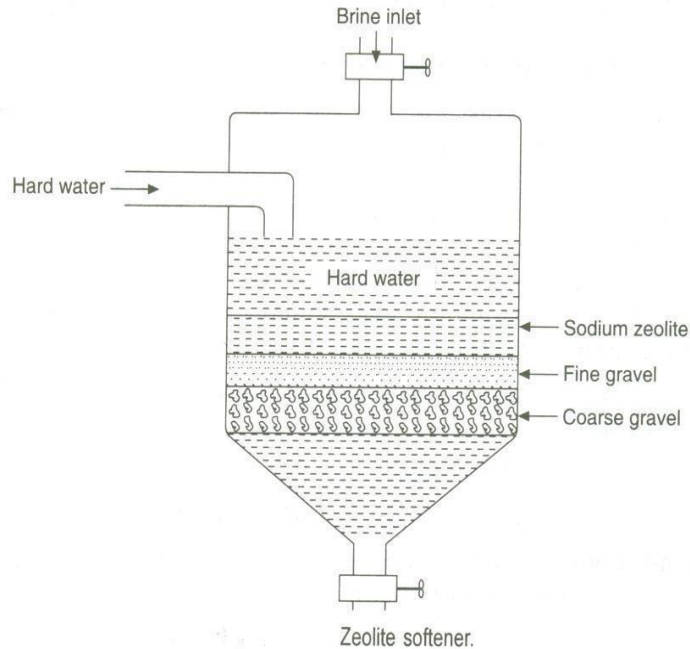


##### Synthetic zeolites

Synthetic zeolites are porous and gelly structure. It is prepared by heating together china clay, feldspar and soda ash. These zeolites have higher exchange capacity per unit weight than natural zeolites.

##### Process

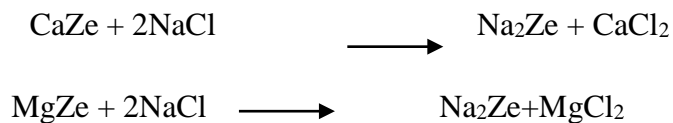
In this process the hard water is allowed to percolate through a bed of sodium zeolite ( $\text{Na}_2\text{Ze}$ ). The hardness causing ions ( $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ ) in hard water is replaced by loosely held sodium ions in zeolite bed.



## Regeneration

After the softening process, the zeolite is completely converted into calcium and magnesium zeolites and it gets exhausted.

At this stage the hard water supply is stopped and the exhausted bed is regenerated by treating with a concentrated (10%) NaCl (brine) solution.



## Advantages of Zeolite process

- (i) It reduces hardness up to 5 ppm.
- (ii) The equipment is quite compact.
- (iii) It requires less time for softening.
- (iv) It requires less skill for maintenance and operation.



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