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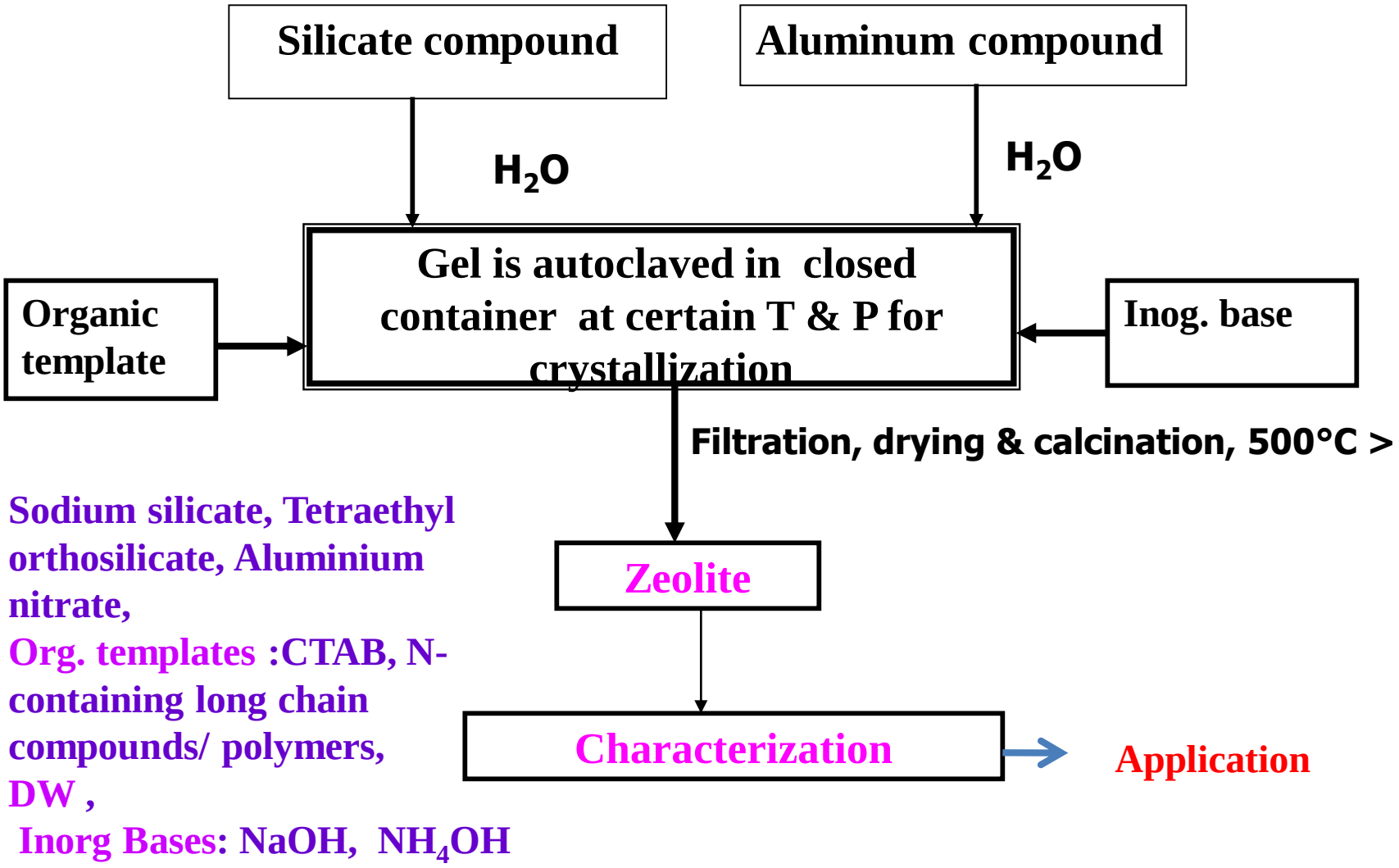
Hydrothermal synthesis of zeolite, Factors affection the Structural morphology of zeolites, Modifciation of Zeolite

Nature to Laboratory

Natural zeolite to synthetic zeolite

Hydrothermal method for the synthesis of zeolite :

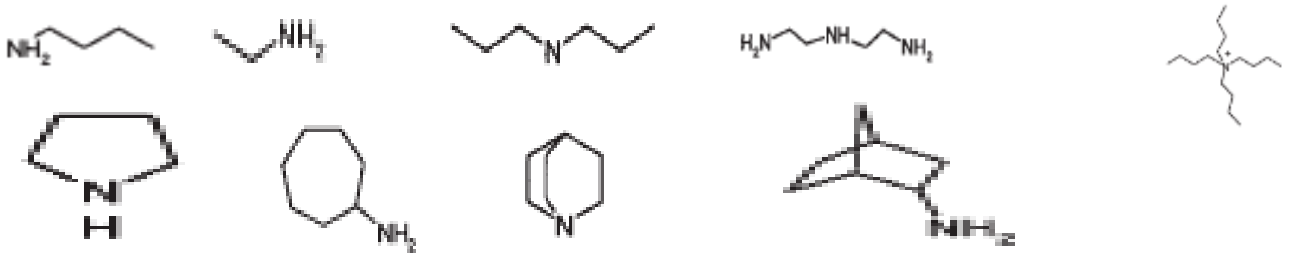


Sodium silicate, Tetraethyl orthosilicate, Aluminium nitrate,
Org. templates :CTAB, N-containing long chain compounds/ polymers,
DW ,
Inorg Bases: NaOH, NH_4OH

How to generate autogeneous pressure ?

Factors affection the Structural morphology of zeolites :

- **Gross composition of reaction mixture**
  Si/Al or Si/ M ratio
  Concentration of OH ion
  Nature of exchangeable species either I or II group
  Nature of Organic template : Nitrogen containing organic cation or neutral species act as structure directing agent



- **Time : Given for Mixing, stirring, ageing and hydrothermal treatment**
- **Crystallization temperature range from RT to 300°C**
- **Pressure - Autogenously generated pressure – It is depend on temperature given for hydrothermal treatment**

M. Sc. project Fabricated Autoclave for hydrothermal treatment
2006

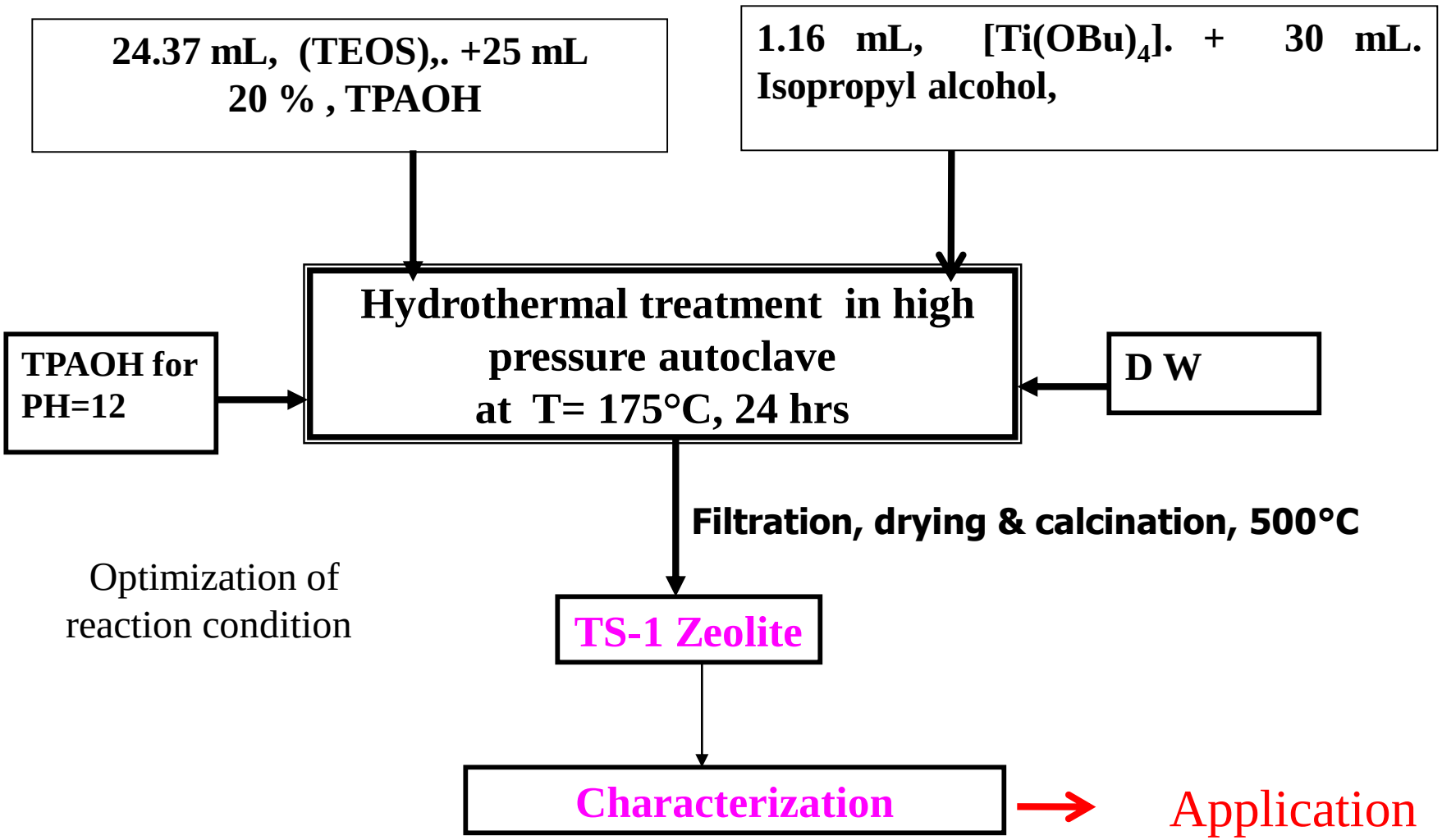
Ultrasonicator

Max. Temp up to 100°C
Pressure – autogenously
Handle with very carefully

High pressure Autoclave

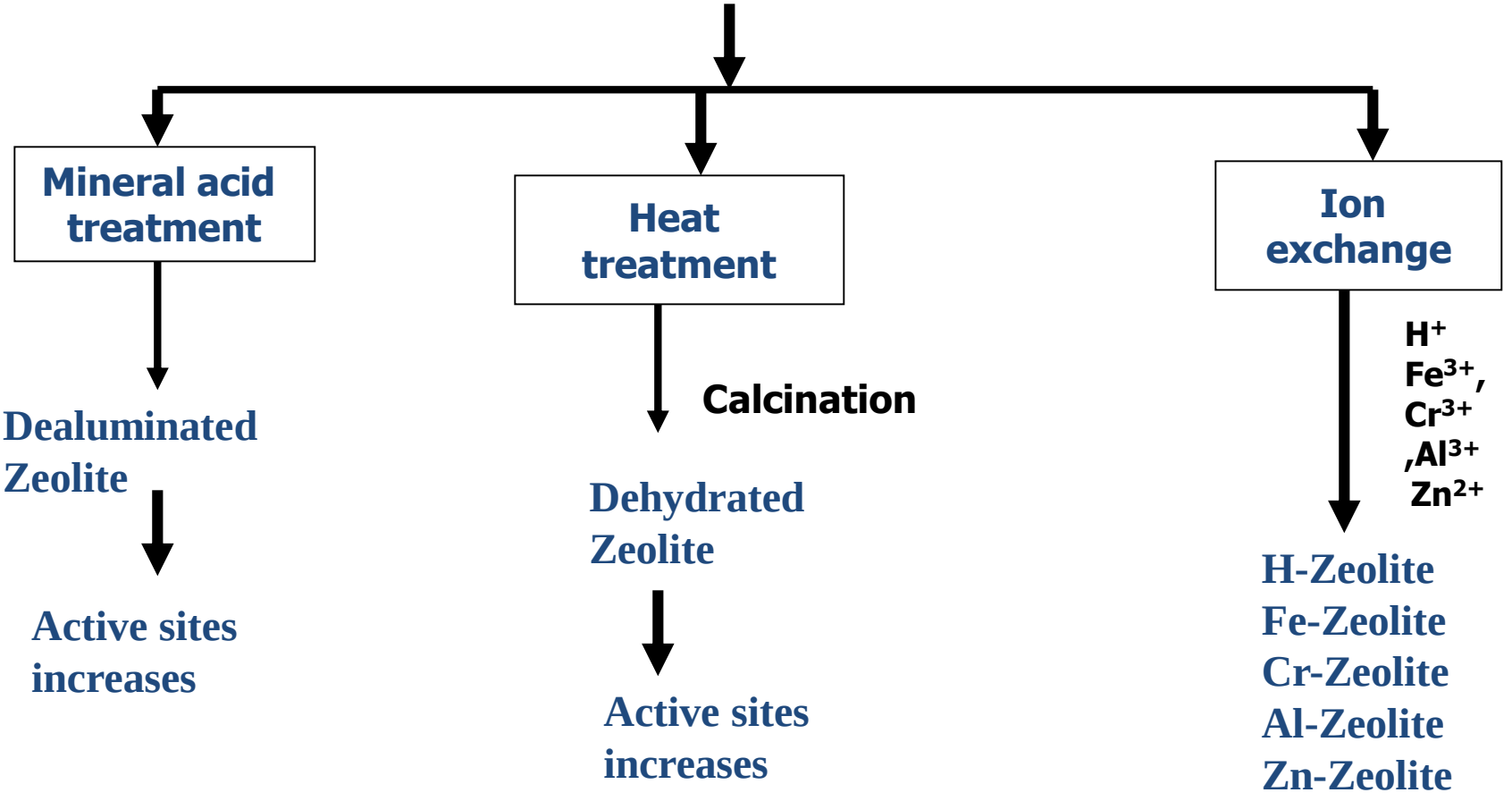
Max. Temp up to 300°C
Max. Pressure range - 1450 psi
Nitrogen atmosphere facility

Synthesis of transition metal containing TS-1 zeolite :



Similarly we have synthesized beta zeolite, ZnO- beta zeolite :

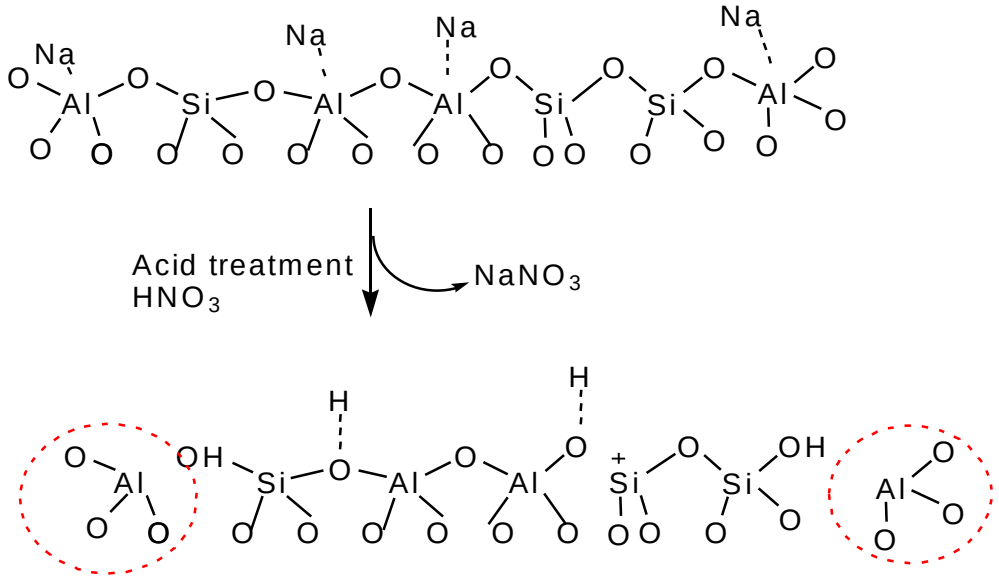
Modification of zeolites if required



What happen when zeolite treated with (HCl, HNO_3 or H_2SO_4 treatment ?

Na-zeolite + HNO_3 + H_2O $\xrightarrow{\text{Dealumination}}$ H-zeolite $\xrightarrow{\text{Calcinations}}$ H- zeolite

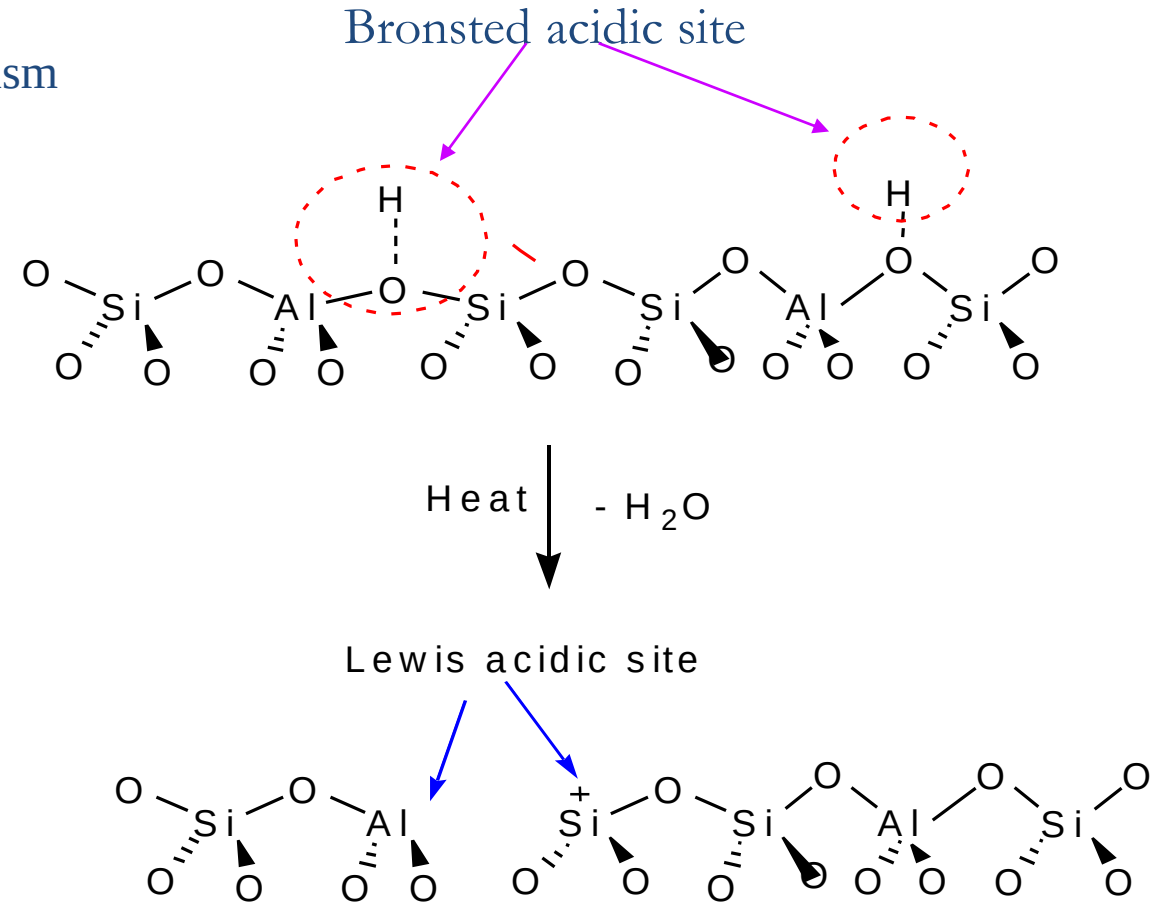
Mechanism



Al - detaches or solublizes with acid to form dealuminated zeolite framework thereby increase the Lewis as well as Bronsted acid site

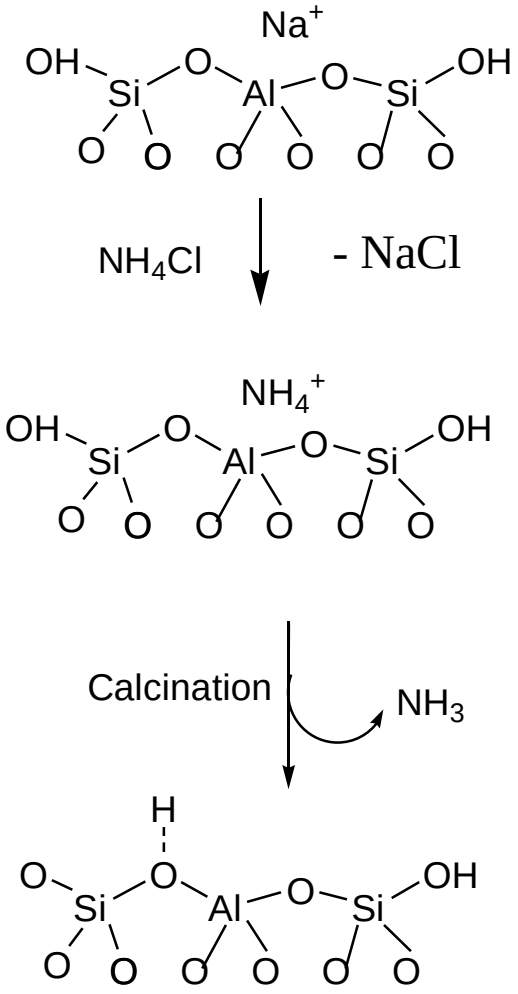
Heat treatment :

Mechanism



Ion exchange treatment with NH_4Cl

Mechanism



Generation of Bronsted acidic sites

Thank You All