# Zeolite Synthesis

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## 1 SAPO-14

Source: High Propylene Selectivity in Methanol Conversion over a Small-Pore SAPO Molecular SIeve Ultra-Small Cage

### 1.1 Material List

- Pseudoboehmite (65.5 wt %)
- Phosphoric Acid (85 wt %)
- Isopropylamine (IPA)
- Tetraethyl Orthosilicate (TEOS)

### 1.2 Process description

1. Dissolvation of pseudoboehmite (65.5 wt %) in destilled water (pseudoboehmite = hydrated form of alumina (aluminum oxide $Al_2O_3$))
2. Adding in sequence with stirring:
    - Phosphoric Acid: $H_3PO_4$ (85 wt %)
    - Isopropylamine (IPA) (= organic template)
    - Tetraethyl Orthosilicate (TEOS) (= providing silicon component)
    - molar compositions of reactant gels:
      1.0 $Al_2O_3$ / 1.0 $P_2O_5$ / (0 - 0.18) $SiO_2$ / (1.0 - 1.4) IPA / (40 - 75) $H_2O$
3. transfer of mixtures to stainless steel autoclaves and heated to **200°C** for **48h** under rotation
4. Products are filtered, washed and dried in air

# 2 SAPO-34

Source: Development and study of a tandem catalyst system for the single pass coneversion of $CO_2$ to higher alcohols

## 2.1 Material List

- $Al(OH)_3$ (50-57 wt%, Sigma Aldrich)
- Phosphoric Acid ( $\geq$ 85% , Sigma Aldrich )
- N,N-Diisopropylethylamine (DIPEA) ($\geq$ 99% , Sigma Aldrich)
- LUDOX HS-40 colloidal silica ($\geq$ 40% , Sigma Aldrich)

## 2.2 Process description

1. Dissolve 2.167g of $Al(OH)_3$ (50-57 wt%, Sigma Aldrich) in 4.068 ml deionized water
2. Leave solution aging at room temperature under magnetic stirring for 1h
3. Adding in sequence with stirring and left for 1h at room temperature (continue stirring):
   - 1.6856 ml Phosphoric Acid ( $\geq$ 85% , Sigma Aldrich )
   - 4.597 ml N,N-Diisopropylethylamine (DIPEA) ($\geq$ 99% , Sigma Aldrich)
   - 0.3205 ml LUDOX HS-40 colloidal silica ($\geq$ 40% , Sigma Aldrich)
4. Molar decomposition of resulting gel:
   0.5 $Al_2O_3$ : 0.45 $P_2O_5$ : 0.1 $SiO_2$ : 0.95 DIPEA : 9.5 $H_2O$
5. Transfer of mixed gel into 50ml Teflon-lined stainless steel autoclave
6. Heated for **2h** at **120°C**
7. Heated for **20h** at **200°C**
8. Centrifugation for product recovering
9. Washing with deionized water (5x)
10. Drying at **110°C** for **2h**
11. Calcination at **650°C** for **12h** with a heating rate of **5 °C/min**