(a) Precursor preparation

<table>
<thead>
<tr>
<th>Alkaline</th>
<th>Al-precursor</th>
<th>Template</th>
<th>Reaction medium</th>
<th>Si-precursor</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaOH</td>
<td>Sodium aluminate</td>
<td>TPABr</td>
<td>Deionized water</td>
<td>Fumed silica</td>
</tr>
</tbody>
</table>

- Mixing of aq. solution for 60 min at room temperature
- Gradually addition of fumed silica solution and mixing for 24 h
- Gel formation in appropriate molar ratio of $x\text{Al}_2\text{O}_3\cdot 1.0\text{SiO}_2\cdot 0.1\text{Na}_2\text{O}\cdot 0.1\text{TPABr}\cdot 35\text{H}_2\text{O}$, ($x = 0.0023-0.0042$)

(b) Hydrothermal synthesis

Hydrothermal synthesis: in a stainless steel autoclave reactor at 150°C for 144 h

(c) Post treatment

- Filtration and washing with deionized water
- Drying at 110°C for 24 h under air flow
- Calcination at 550°C for 15 h under air flow
- Support: NaZSM-5

(d) Ion exchange of NaZSM-5 to HZSM-5

- $\text{NH}_4\text{NO}_3$ (1M aq. solution)

2 times

- Ion Exchange
  - for 12 h with reflux at 80°C
  - Drying at 110°C for 12 h under air flow
  - Calcination at 500°C for 4 h under air flow
- Support: HZSM-5
  - ($\text{Si/Al}=120$, $\text{Si/Al}=140$, $\text{Si/Al}=180$, $\text{Si/Al}=220$)

Figure 1s. Preparation steps of HZSM-5 catalyst with various Si/Al ratios.
(a) Precursors preparation

<table>
<thead>
<tr>
<th>P-precursor</th>
<th>Si-precursor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphoric acid: 85 wt% (aq.)</td>
<td>Tetraethyl orthosilicate</td>
</tr>
<tr>
<td>Al-precursor</td>
<td>Template</td>
</tr>
<tr>
<td>ATIP: Aluminum triisopropylate</td>
<td>TEAOH: 20 wt% (aq.)</td>
</tr>
</tbody>
</table>

- Mixing of aq. solution for 90 min
- Gradually addition of phosphoric acid aq. solution and mixing for 60 min
- Gradually addition of tetraethyl orthosilicate and aging with mixing for 24 h

Gel formation in appropriate molar ratio of $\text{Al}_2\text{O}_3/\text{SiO}_2/\text{P}_2\text{O}_5/\text{TEAOH/H}_2\text{O} = 1/0.6/1/2/70$ (pH = 7-8)

(b) Hydrothermal synthesis

Hydrothermal synthesis: in a stainless steel autoclave reactor at 200°C for 36 h

(c) Post treatment

- Filtration and washing with deionized water
- Drying at 110°C for 24 h under air flow
- Calcination at 550°C for 12 h under air flow

Catalyst forming: SAPO-34

Figure 2s. Preparation steps of SAPO-34 catalyst.
(a) Precursors preparation

\[ \text{P-precursor} \quad \text{Si-precursor} \]

\[ \text{Al-precursor} \quad \text{Template} \quad \text{Reaction medium} \]

\[ \text{ATIP: Aluminum triisopropylate} \quad \text{TEAOH: 20 wt\% (aq.)} \quad \text{Deionized water} \]

\[ \text{Mixing of aq. solution for 90 min} \]

\[ \text{Gradually addition of phosphoric acid aq. solution and mixing for 60 min} \]

\[ \text{Gradually addition of tetraethyl orthosilicate and aging with mixing for 24 h} \]

\[ \text{Gel formation in appropriate molar ratio of} \]
\[ \frac{\text{Al}_2\text{O}_3}{\text{SiO}_2}/\text{P}_2\text{O}_5/\text{TEAOH/H}_2\text{O} = 1/0.6/1/2/70 (\text{pH}=7-8) \]

\[ \text{Addition of HZSM-5 (50\%) and aging with mixing for 24 h} \]

(b) Hydrothermal synthesis

\[ \text{Hydrothermal synthesis: in a stainless steel autoclave reactor at 200°C for 36 h} \]

(c) Post treatment

\[ \text{Filtration and washing with deionized water} \]
\[ \text{Drying at 110°C for 24 h under air flow} \]
\[ \text{Calcination at 550°C for 12 h under air flow} \]
\[ \text{Catalyst forming: SAPO-34(50\%)/HZSM-5(50\%)} \]

Figure 3c. Preparation steps of nanostructured SAPO-34/ZSM-5 catalyst.