

Synthesis of spherical mesoporous silica, APMS (Acid Prepared Mesoporous Spheres)

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Experimental

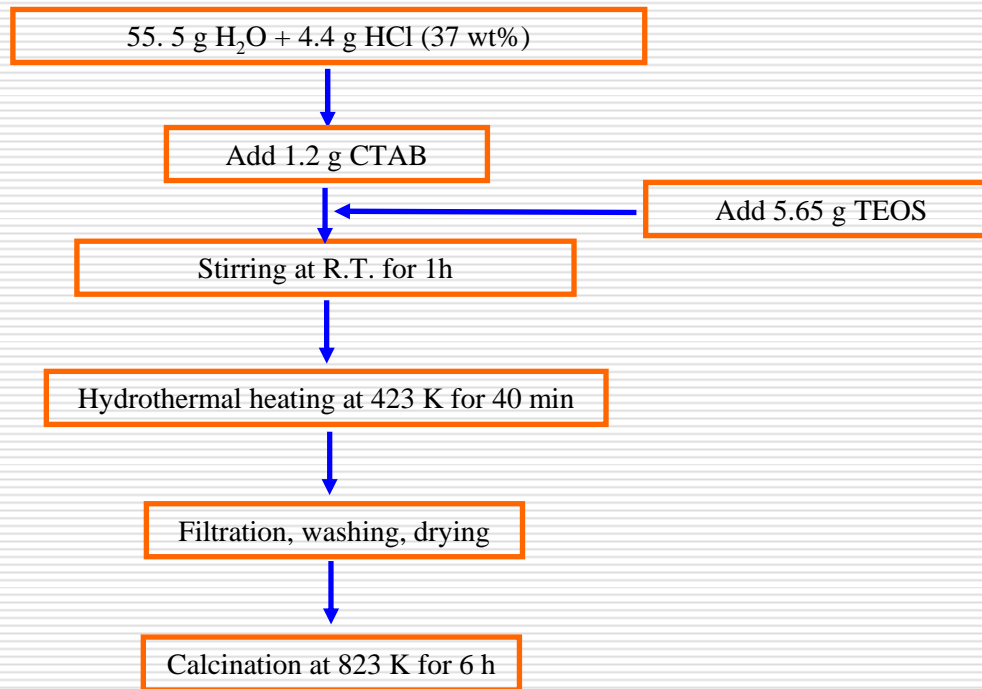
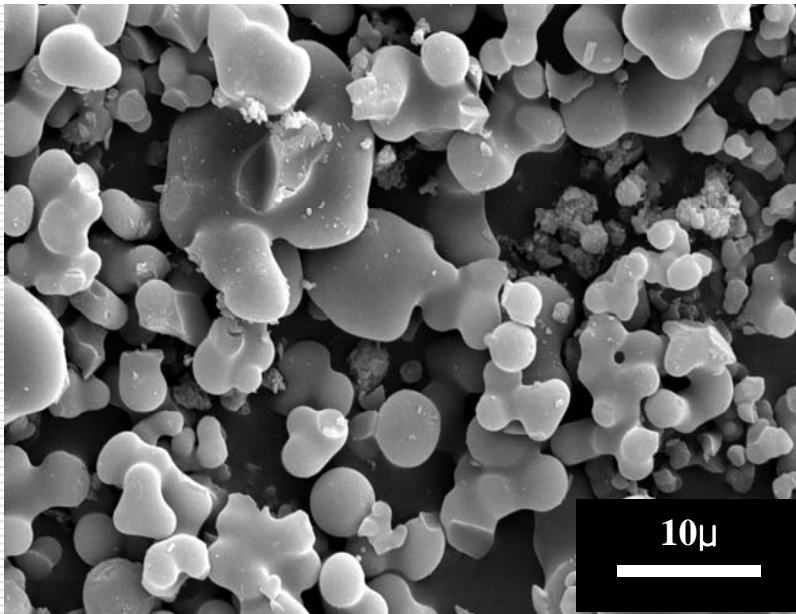


Fig. 1 : Synthesis protocol

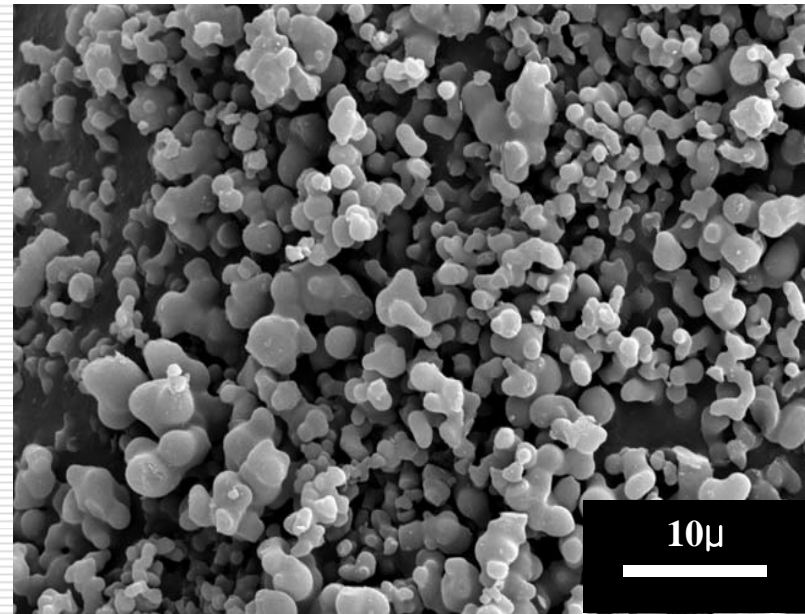
substrate composition

H₂O : HCl : CTAB : TEOS = 100 : 3.87 : 0.102 : 0.840

Effect of TEOS Addition Method



Addition at once

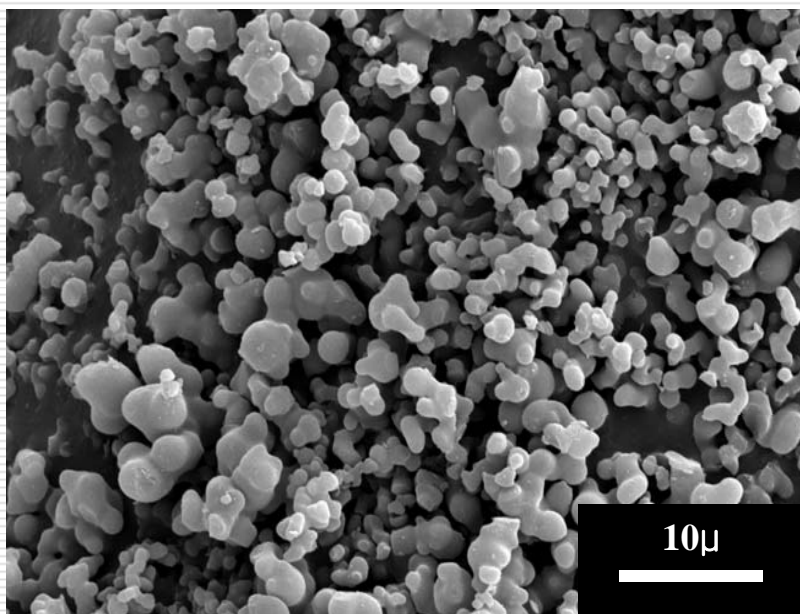


Dropwise addition

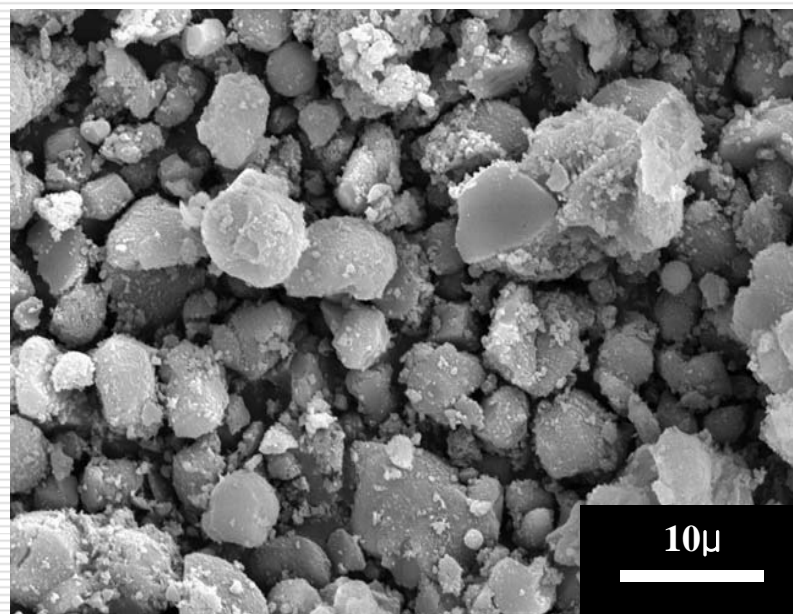
substrate composition

$\text{H}_2\text{O}:\text{HCl}:\text{CTAB}:\text{TEOS} = 100: 3.87: 0.102: 0.840$

Effect of Stirring



Static

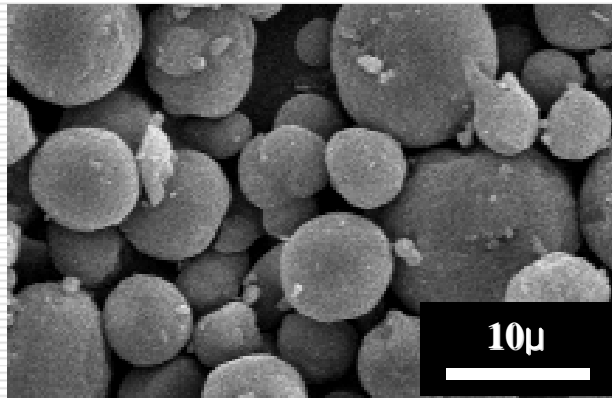


With stirring

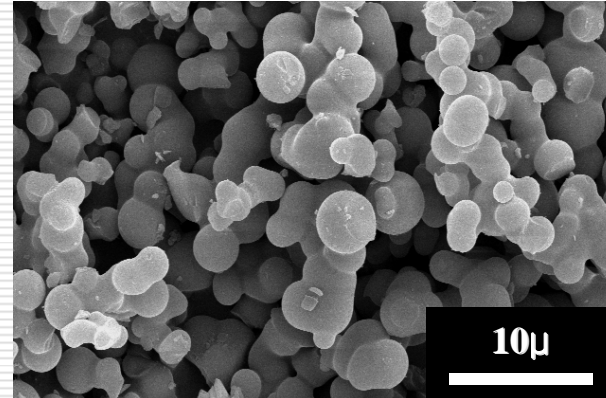
substrate composition

$\text{H}_2\text{O}:\text{HCl}:\text{CTAB}:\text{TEOS} = 100: 3.87: 0.102: 0.840$

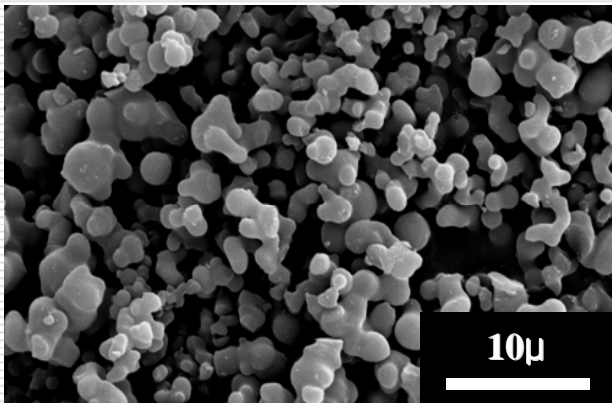
Effect of Temperature



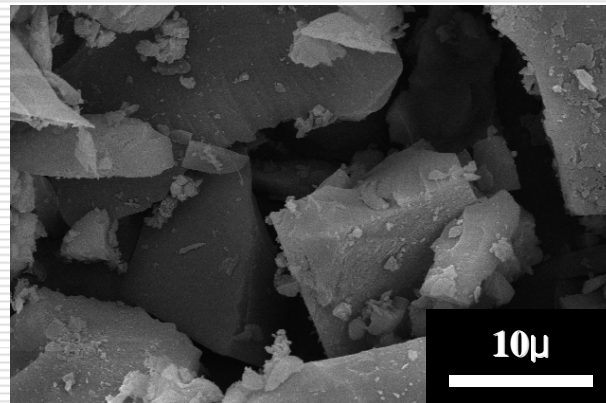
100 °C



130 °C



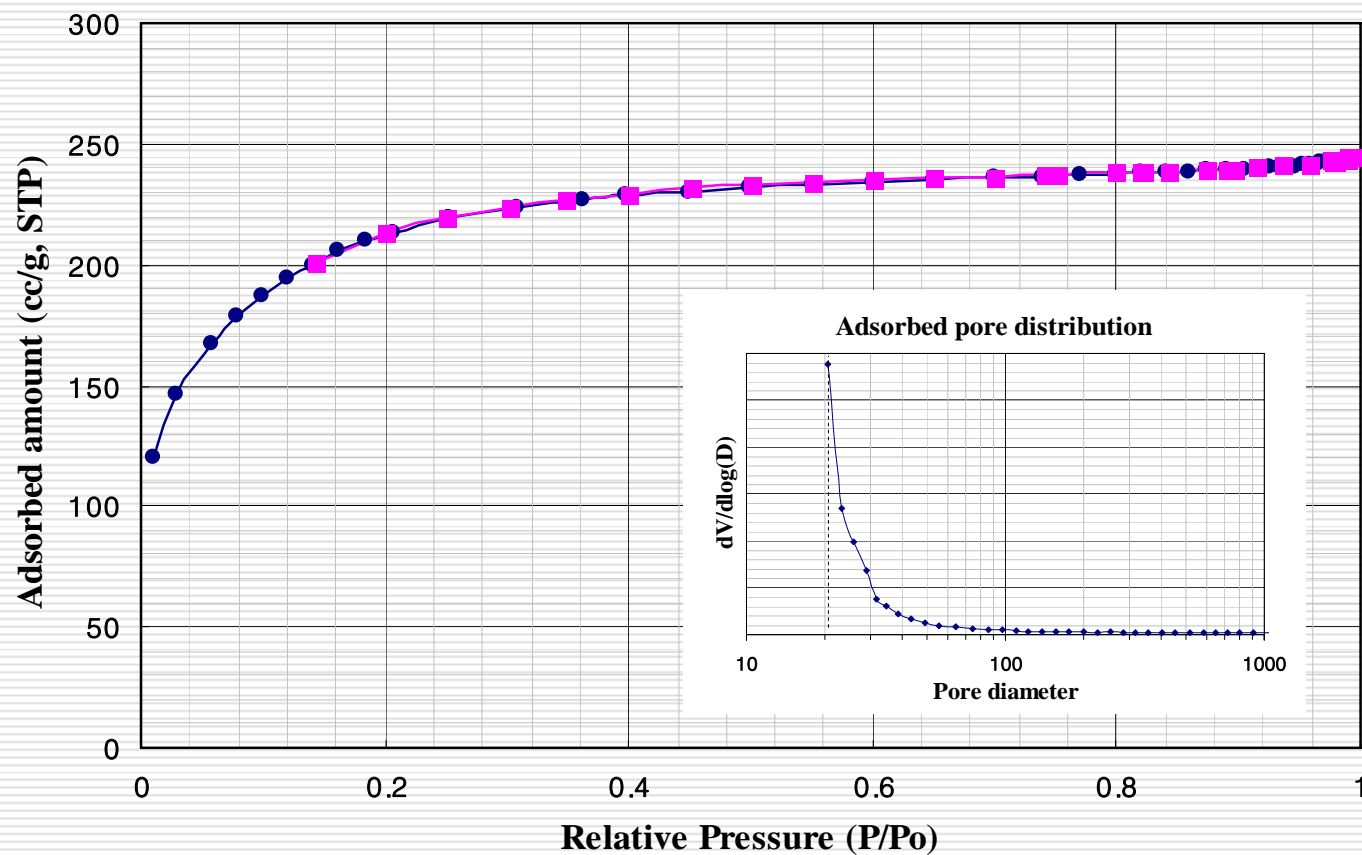
150 °C



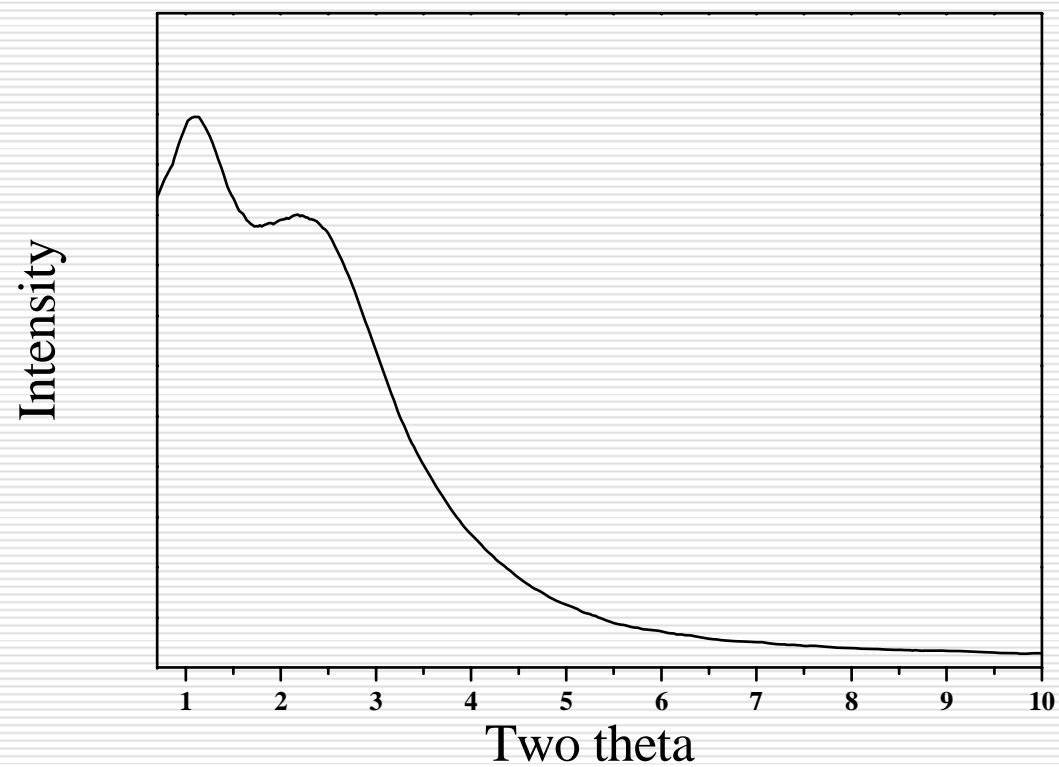
170 °C

N₂ Physisorption Result

Isotherm plot



XRD patterns



Conclusions

- ❑ APMS spherical silica particles could be prepared in 40 min using TEOS and CTMABr at 423 K.
- ❑ Dropwise addition of TEOS in static synthesis condition was necessary.
- ❑ 130 – 140 °C was the optimum synthesis temperature.
- ❑ APMS has surface area of ca. 760 m²/g with pores in the 2.4 nm range.
- ❑ Uniformity in shape was not as good as that of MSU-1 prepared in two steps of hydrolysis and condensation.