# AFI SSZ-24 Si(100)

**Contributed by** S. I. Zones and L T. Yuen

**Verified by** A. Bell, C. Gittleman, A. Cheetham, R Lobo and D. Shantz

**Type Material** $(SiO_2)_{24}$. $aRN^+$ a = 0.96 ± 0.24 ($RN^+$ = trimethyl-1-adamantammonium)

**Method** R. A. Van Nordstrand, D. S. Santilli, S. I. Zones [1]

**Batch Composition** 5 $K_2O$ : 15 $RN^+$:100 $SiO_2$ : 4400 $H_2O$

**Source Materials**

deionized water
$RN^+$ (see above) 0.72 Molar [2]
potassium hydroxide (Baker reagent, 87.8% KOH)
fumed silica (Cab-O-Sil M5, 97% $SiO_2$, 3% $H_2O$)

**Batch Preparation** (for 3.5 g product)

(1) [38.32 g water + 13.90 g (0.72M $RN^+$) + 0.44 g potassium hydroxide], mix until dissolved
(2) [(1) + 4.00 g fumed silica], mix in the Teflon liner of a 125 mL Parr stainless steel reactor [a]

**Crystallization**

Vessel: Parr 125 mL reactor (Teflon-lined) heated in a Blue M oven
Temperature: 150°C
Time: 7 days [b,c]
Agitation: none

**Product Recovery**

(1) Upon cooling to room temperature, the product should be settled to the bottom of the reactor liner; pH with a calibrated probe should be 11.50-11.70
(2) Filter to recover solids (medium grade glass-frit funnel)
(3) Wash product with approximately 100 mL 0.01N KOH solution [d]
(4) Wash with approximately 1 liter water
(5) Air dry overnight while pulling a vacuum through the frit
(6) Yield: 3.52 g; 79% yield based on $SiO_2$

**Product Characterization**

XRD: AFI only crystalline phase
Elemental Analysis: $RN^+$ is approximately 10 wt% and alkali cation is usually less than 0.5 wt%. The remaining material is $SiO_2$ [3]
Crystal Size and Habit: Typically, hexagonal rods composed of identical hexagonal plates on top of each other. The rods are usually about 10 μm long

**References**

[1] R. A. Van Nordstrand, D. S. Santilli, S. I. Zones in Molecular Sieve Science, ACS Symp. Ser. 368. W. H. Flank, T. E Whyte, (eds.), Am. Chem. Soc., Washington, D. C., 1988, pp. 236-245
[2] S. I. Zones, US Patent 4665 110 (1987)
[3] I. Petrovic, A. Navrotsky, M. E.. Davis, S. I. Zones, Chem. Mater. 5 (1993) 1805
[4] R. A. Van Nordstrand, D. S. Santilli, S. I. Zones, in Synthesis of Microporous Materials, Vol. 1, M. L Occelli, H. E. Robson (eds.), Van Nostrand Reinhold, New York, 1992. pp. 373-383

**Notes**

a. High speed stirring of this preparation leads to SSZ-23 formation [1].
b. The reaction can be accelerated by seeding after some initial material has been made.
c. The synthesis of the borosilicate [4] requires only one day; the crystals are smaller.
d. The alkaline wash helps to prevent unreacted silica from coming out of solution during washing and causing pore.