

**AST**

**AlPO<sub>4</sub>-16**

**Al(50), P(50)**

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**Verified by** J. Shi and K. Balkus, by D. Akporiaye, and by T. Blasco

**Type Material** (Al<sub>10</sub>P<sub>10</sub>O<sub>10</sub>)Q<sub>2.0</sub>F<sub>1.6</sub>: 3.0 H<sub>2</sub>O<sup>a</sup> (Q= quinucidine)

**Method** C. Schott-Darie, J. Patarin, P. Y. Le Goff, H. Kessler and E. Benazzi [1]

**Batch Composition** 1 P<sub>2</sub>O<sub>5</sub> : 1 Al<sub>2</sub>O<sub>3</sub> : 1 Q : 1 HF : 60 H<sub>2</sub>O

**Source Materials**

distilled water  
phosphoric acid (Fluka, 85% H<sub>3</sub>PO<sub>4</sub>)  
aluminum isopropoxide (Aldrich, 98%)  
quinuclidine C<sub>7</sub>H<sub>13</sub>N (Fluka, 97%)  
hydrofluoric acid (Prolabo, 40%)

**Batch Preparation**<sup>b</sup> (for 1.5 g of as-synthesized product)

- (1) [4.00 g water + 2.31 g phosphoric acid + 4.17 g aluminum isopropoxide], stir until homogenized
- (2) [6.15 g water + 1.14 g quinuclidine], stir until dissolved
- (3) [(1) + (2) + 0.50 g hydrofluoric acid], stir for 2 minutes. Gel pH= 7 to 7.5

**Crystallization**

Vessel: Teflon-lined stainless steel autoclave (50 cm<sup>3</sup>)  
Temperature: 150°C  
Time: 24 hours  
Agitation: none  
Final pH: approximately 8

**Product Recovery**

- (1) Dilute the reaction mixture with distilled water
- (2) Filter or centrifuge
- (3) Wash until the pH of the filtrate is 5.5 to 6
- (4) Dry at 60-70°C overnight
- (5) Yield: 50% based on aluminum (as-synthesized product containing quinuclidine and some water)<sup>d</sup>

**Product Characterization**

XRD: AST (only crystalline phase), Space group 14, a<sub>0</sub> = 9.3423(1) Å c<sub>0</sub> = 13.4760(2) Å<sup>e</sup>  
Elemental Analysis (wt%): Al<sub>2</sub>O<sub>3</sub> = 32.8, P<sub>2</sub>O<sub>5</sub> = 44.8, F = 1.9, (C<sub>7</sub>H<sub>13</sub>)N = 15.4, H<sub>2</sub>O = 3.4  
Crystal Size and Habit: tetrahedra, 0.5 to 3 μm

**References**

- [1] C. Schott-Daric, J. Patarin, P. Y. Le Goff, H. Kessler, E. Benazzi, *Micropor. Mater.* 3 (1994) 123
- [2] J. M. Bennett, R. M. Kirchner, *Zeolites* 11(1991) 502

**Notes**

- a. The Q/F molar ratio is lower than 1. Part of the quinucidine is either not protonated or OH<sup>-</sup> groups are present in order to get a neutral material.
- b. The starting mixture is prepared in a polyethylene vessel.
- c. The reaction is exothermic.
- d. After calcination (removal of the organic and fluoride species) the cubic form [2] of AlPO<sub>4</sub>-16 is obtained.
- e. According to reference [1].