AFS MAPO-46 P(50),Al(40),Mg(10)

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Type Material $Mg_{5.54}Al_{22.4}P_{28.06}O_{112} \cdot 8.1\ R \cdot 11.0\ H_2O$ (R = di-n-propylamine)

Method D. B. Akolekar, S. Kaliaguine [1]

Batch Composition 2 R: 0.30 MgO : 0.85 Al_2O_3 : 1.0 P_2O_5 : 50 H_2O

Source Materials

deionized water
orthophosphoric acid (85%, Aldrich)
pseudoboehmite (Vista Chemical Co., 71.8% Al_2O_3)
magnesium oxide (99.9%, Aldrich)
n-dipropylamine (99%, Aldrich, 0.738 g/mL)

Batch Preparation (for 20 g dry, template-free product)

(1) [65.0 g water + 25.16 g o-phosphoric acid + 13.18 g pseudo-boehmite], stir until homogeneous
(2) [(1) + 1.32 g magnesium oxide + 32.0 g water], stir until homogeneous
(3) [(2) + 29.9 mL n-.dipropylamine], stir until homogeneous (about 35 minutes) [a]

Crystallization

Vessel: PFFE-lined stainless steel autoclave (200 mL)
Temperature: 162°C
Tune: 240 hours
Agitation: none

Product Recovery

(1) Stir the total crystallization batch into 1.5 L deionized water. Allow to stand for a few minutes, then decant the top organic layer
(2) Filter; wash with deionized water
(3) Dry at 75°C
(4) Yield: > 60% based on Al_2O_3

Product Characterization

XRD: AFS, only crystalline product [2-4]; characteristic strong reflections at d = 11.43 and 4.12 Å
Elemental Analysis (H_2O and template-free): 0.396 MgO · 0.80 Al_2O_3 · 1.00 P_2O_5
Crystal Size and Habit: hexagonal rod-like, 0.8 x 8 μm

References

[1] D. B. Akolekar, S. K. Kaliaguine, 1. Chem. Soc., Faraday Trans. 89 (1998) 4141
[2] S. T. Wilson, E. M. Flanigen in ACS Symp. Ser. 398, M. L Occelli, H. F. Robson (eds.), Am. Chem. Soc., Washington, D.C., 1989, p. 329

[3] E. M. Flanigen, R L Patton, S. T. Wilson, Stud. Surf. Sci. Catal. 37 (1988) 13
[4] J. M. Bennett, B. K. Marcus, Stud. Surf. Sci. Catal. 37 (1988) 269

Note

a. Uniform homogeneous gel formation is the important step for obtalning pure phase material.