LTL Nanosized Linde Type L Si(72), Al(27)

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Type Material: $K_9[Si_{27}Al_{19}O_{72}] : 21\ H_2O$

Method: M. Tsapatsis, M. Lovallo, T. Okubo, M.E. Davis, M. Sadakatas [1]
M. Hölzl, S. Mintova, T. Bein [2]

Batch Composition: $5\ K_2O : 0.5\ Al_2O_3 : 10\ SiO_2 : 200\ H_2O$

Source Materials

aluminium hydroxide (80 wt.% $Al(OH)_3$, 20 wt.% H_2O, Sigma Aldrich)
potassium hydroxide (≥ 85% KOH, Pellet, Aldrich)
silica sol (Ludox SM-30, 30 wt. % suspension in H_2O, pH = 9.7-10.3, Aldrich)
deionized water (DI)

Batch Preparation

(1) [0.488 g of $Al(OH)_3$ + 5.4 g H_2O + 2.196 g of KOH], stir in a flask[a]
(2) [10 g Ludox SM-30+ 5 g H_2O + 1.098 g of KOH], stir in a flask[a]
(3) [(1) drop wise + (2)], stir vigorously in a flask cooled in ice bath[a]
(4) The white suspension turns to clear after aging for 40 h at RT

Crystallization

Vessel: Teflon-lined stainless steel autoclave
Temperature: 170 °C
Time: 20 h

Product Recovery

(1) Centrifugation (2000 rpm, 1h) and redispersion in water, washed until pH = 8

(2) Freeze-dry the final product

Product Characterization

XRD: LTL; no competing phase
DLS: monodispersed, average particle size of 40 nm
TEM: cylindrical shape, homogeneous and fully crystalline particles

References

[1] M. Tsapatsis, M. Lovallo, T. Okubo, M.E. Davis, M. Sadakatas, Chem. Mater. 7 (1995) 1734
[2] M. Hölzl, S. Mintova, T. Bein, Stud. Surf. Sci. Cata. A 158 (2005) 11

Notes

a. Clear solution is obtained.