EMT EMC-2 Si(79), Al(21)

Contributed by Jens Weitkamp

Verified by Kuei-Jung Chao and T. Chatelain

Type Material $Na_{20}[Al_{20}Si_{76}O_{192}]$. $(18\text{-crown-6})_4$ [1]

Method J. Weitkamp, R Schumacher [1-3]

Batch Composition 2.2 Na_2O : Al_2O_3 : 10 SiO_2 : 140 H_2O : 0.87 (18-crown-6)

Source Materials

demineralized water
sodium hydroxide (Fluka reagent grade)
sodium aluminate (Riedel-de Haen; 54% Al_2O_3, 41% Na_2O)
crown ether (Fluka 18-crown-6)
silica sol (Bayer AG, VP 4039, 30% SiO_2)

Batch Preparation (for 19 g product)[a]

(1) [39 g water + 6.05 g NaOH solution (50%) + 7.26 g sodium aluminate + 8.81 g (18-crown-6)], dissolve under continuous stirring
(2) [(1) + 77 g silica sol], stir vigorously

Crystallization

Vessel: stainless steel autoclave (150 mL)
Incubation: one day at room temperature
Temperature: 110°C
Time: 12 days
Agitation: none

Product Recovery

(1) Filter and wash extensively with demineralized water
(2) Dry at 120°C for 16 hours
(3) Yield: approximately 19 g (still containing the template and some adsorbed water), 56% based on Al [b]

Product Characterization

XRD: EMT; competing phases: GIS and FAU
Elemental Analyses SiO_2/Al_2O_3 =7.6 (by AES/ICP and ^{29}MAS NMR) [2]
Crystal Size and Habit: hexagonal, 4-5 μm mean diameter, 0.5 to 1.0 μm thick

References

[1] F. Delprato, L Delmotte, J.-L Guth, L Huve, Zeolites 10 (1990) 546
[2} J. Weitkamp, R. Schumacher, in Proceed. Ninth hit. Zeo. Conf., R. von Ballmoos, J. B. Higgins, M. M. J. Treacy, (eds.), Butterworth-Heinemann, Boston, 1993, p. 353
[3] J. Weitkamp, R Schumacher, U. Weib, Chem.-Ing. Tech. 64 (1993) 1109

Notes

a. This synthesis has been successfully scaled-up by a factor of four (yield 69 g).
b. Calcination at 540˚C in air for 16 hours removes template.