

MOR

Mordenite

Si(90), Al(10)

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Type Material $\text{Na}_5[\text{Al}_5\text{Si}_{43}\text{O}_{96}] : w \text{ H}_2\text{O}$

Method G. J. Kim, W. S. Ahn [1]

Batch Composition 6 Na_2O : Al_2O_3 : 30 SiO_2 : 780 H_2O

Source Materials

distilled water

sodium hydroxide (Junsei Co., 95% NaOH)

sodium aluminate (Junsei Co., 32.6% Na_2O , 35.7% Al_2O_3)

silica powder (Zeosil from Kofran Co., 91.8% SiO_2 , 8.2% H_2O)^a

Batch Preparation (for 56 g dry product)

- (1) [40 g water + 19 g sodium hydroxide], stir until dissolved
- (2) [(1) + 14.3 g sodium aluminate], stir until dissolved
- (3) [(2) + 645 g water], mix
- (4) [(3) + 98.2 g silica], stir for 30 minutes

Crystallization

Vessel: Teflon-lined stainless steel autoclave

Incubation: none^b

Temperature: 170 °C

Time: 24 hours^c

Product Recovery

- (1) Filter and wash to pH < 10
- (2) Dry at 100 °C
- (3) Yield: near 100% on Al_2O_3

Product Characterization

XRD: 100% mordenite, characteristic peaks at $d = 3.45, 3.97, 9.02, 3.27$ and 3.21

Å competing phases: quartz, analcime, gismondine

Elemental Analysis: $\text{Na}_2\text{O} : \text{Al}_2\text{O}_3 : 17.2 \text{ SiO}_2$

Crystal Size and Habit: irregular spherical to prismatic, $\sim 5 \mu\text{m}$ ^d

Reference

- [1] G. J. Kim, W. S. Ahn, Zeolites 11(1991) 745

Notes

- a. Sodium silicate can also be used as a silica source, but crystallization rates are lower.

- b. Incubation is not required when using silica powder as SiO₂ source; aging at room temperature resulted in larger crystals but lower crystallization rates.
- c. Seeding with 5 wt% mordenite in the reaction batch substantially improved the crystallization rate.
- d. Typically needle-shaped crystals, but siliceous crystals can be plate or flat prismatic shape.