

KFI

ZK-5

Si(77). Al(23)

Contributed by J. P. Verduijn

Verified by J. Patarin, I. Kornatowski and S. Ahmed

Type Material $K_{22}[Al_{22}Si_{74}O_2]$: w H₂O

Method J. P. Verduijn [1]

Batch Composition 2.30 K₂O : 0.1 Sr(NO₃)₂ : Al₂O₃ : 10 SiO₂ : 160 H₂O

Source Materials

deionized water

potassium hydroxide (Baker 0222, pellets, 86.8% KOH)

alumina (Baker 0005, 98.6% Al(OH)₃)

silicic acid (AKZO SM 604, 90% SiO₂)^a

strontium nitrate (Fluka 85900)^b

Batch Preparation (for 57 g product)

- (1) [50.00 g water + 29.76 g potassium hydroxide + 15.80 g alumina], heat to boiling until clear; cool to room temperature and correct weight loss due to boiling
- (2) [96.97 g water + 66.77 g silicic acid], mix until smooth (approximately 6 minutes)
- (3) [75.08 g water + 2.124 g strontium nitrate], mix until dissolved
- (4) [(2) + (3) + 25.12 g water (rinse)], mix for 6 minutes
- (5) [(4) + (1) + 25.08 g water (rinse)], mix for 6 minutes^c

Crystallization

Vessel: 300 mL stainless steel autoclave^d

Time: 115 hours^e

Temperature: 150 °C^f

Agitation: none

Product Recovery

- (1) Cool to room temperature^g
- (2) Filter and wash (5 times) with 650 mL water; the pH of the last wash water = 10.5
- (3) Dry in a 150 °C oven for 16 hours
- (4) Yield: 57.2 g (97% on Al₂O₃)

Product Characterization

XRD: KFI (only crystalline product) Elemental Analysis: SiO₂/Al₂O₃ = 6.6

Crystal Size and Habit: ~ 0.5 μm

Reference

- [1] J. P. Verduijn, US Patent 4 944 249 (19 February 1991)

Notes

- a. Colloidal siicas such as Ludox HS-40 are also suitable silica sources.

- b. The Sr^{2+} sources used were $\text{Sr}(\text{OH})_2$ and $\text{Sr}(\text{NO}_3)_2$; there is no preference.
- c. The final gel is (visually) very homogeneous and pourable.
- d. No Teflon liner was used.
- e. Crystallization times (at 150°C) are not critical (90-140 hours).
- f. The autoclave was placed in a room temperature oven. The oven was heated within 2 hours to 150°C and kept at this temperature for 115 hours.
- g. The synthesis magma (after treatment has an amorphous appearance; no free mother liquor can be seen. This is typical for this type of synthesis.