

**FER**

**ZSM-35**

**Si(87), Al(13)**

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**Type Material**  $\text{Na}_5[\text{Al}_5\text{Si}_{31}\text{O}_{72}] \cdot w\text{H}_2\text{O}$  ( $w \sim 18$ )

**Method** P. A. Jacobs, J. A. Martens [1]

**Batch Composition** 1.85  $\text{Na}_2\text{O}$  :  $\text{Al}_2\text{O}_3$  : 15.2  $\text{SiO}_2$  : 592  $\text{H}_2\text{O}$  : 19.7  $\text{C}_2\text{DN}$ <sup>a</sup> ( $\text{C}_2\text{DN}$  ethylenediamine)

**Source Materials**

distilled water  
sodium hydroxide (Merck, reagent grade)  
sodium aluminate (Hopkin & Williams, technical grade)<sup>b</sup>  
silica sol (Dupont Ludox AS-30, 30%  $\text{SiO}_2$ )  
ethylenediamine (Merck, reagent grade)

**Batch Preparation** (for 10 g dry product)

- (1) [129 g water + 0.7 g sodium hydroxide + 3.3 g sodium aluminate], stir until dissolved
- (2) [46.47 g silica sol + 18.3 g  $\text{C}_2\text{DN}$ ], mix
- (3) [(1) + (2)], mix thoroughly

**Crystallization**

Vessel: stainless steel autoclaves (250 mL)  
Temperature: 177°C  
Time: 10 days  
Agitation: 15 rpm, tumbling [2]

**Product Recovery**

- 1) Filter solid products and wash with distilled water
- 2) Dry at 120°C
- 3) Yield: 60% on  $\text{SiO}_2$

**Product Characterization**

XRD: FER (only crystalline phase); Competing phases: quartz, MOR, MFI  
Elemental Analysis:  $\text{SiO}_2/\text{Al}_2\text{O}_3 = 13$   
Crystal Size and Habit: irregular, approximately 1  $\mu\text{m}$  long

**References**

- [1] P. A. Jacobs, J. A. Martens, Stud. Surf. Sci. Catal. 33 (1987) 217
- [2] L. Schreyeck, personal communication
- [3] C. L Kibby, A. J. Perrota, F. L Massoth, J. Catal. 35 (1974) 256
- [4] W. Xu, I. Li, W. Li, H. Zhang, B. Hang, Zeolites 9 (1989) 468

**Notes**

- a. Hydrothermal syntheses using different organic additives are reported in the literature, particularly pyrrolidine [1] and tetramethyl-ammonium cation [3]. Nonaqueous methods based on ethylenediamine plus triethyl-amine give good crystallinity and improved yield. [4]
- b. Assumed 1.28 Na/Al, 16% H<sub>2</sub>O