Effect of Temperature on the Crystallization of Zeolites UZM-5 and UZM-9: An Investigation of the Charge Density Mismatch Barrier

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The crystallization processes of zeolites UZM-5 and UZM-9 at two different temperatures (150 and 100 °C, respectively) in the simultaneous presence of tetraethylammonium (TEA^+), tetramethylammonium (TMA^+), and Na^+ ions as structure-directingagents (SDAs) are compared in order to investigate the influence of temperature on the barrier to charge density mismatch (CDM) zeolite synthesis. At 150 °C, TEA^+ plays a critical role in overcoming the barrier associated with the conversion of soluble TEA^+-aluminosilicate species to yield UZM-5 crystals with a considerably higher Si/Al ratio (ca. 7 vs 3) and a notably higher solid yield (ca. 45 vs 20 wt %) compared with those of UZM-9 crystallized at 100 °C. While the presence of Na^+ is required for overcoming the CDM barrier at 100 °C to UZM-9 crystallization, on the other hand, TMA^+ is the key SDA in the nucleation state synthesis of both UZM-5 and UZM-9. The overall ^{13}C MAS NMR and IR results of this work demonstrate that UZM-5 nucleation begins with the construction of large *lta*-cages followed by the smaller *wbc*-, *rth*-, and *d4r*-cages, which is a result of the cooperation between TEA^+ and TMA^+.