O-26 Crystal growth modifier effect shown by glucosamine in the synthesis of nanoporous silicoaluminophosphate SAPO-35

Irene Pinilla-Herrero,* Carlos Márquez-Álvarez and Enrique Sastre

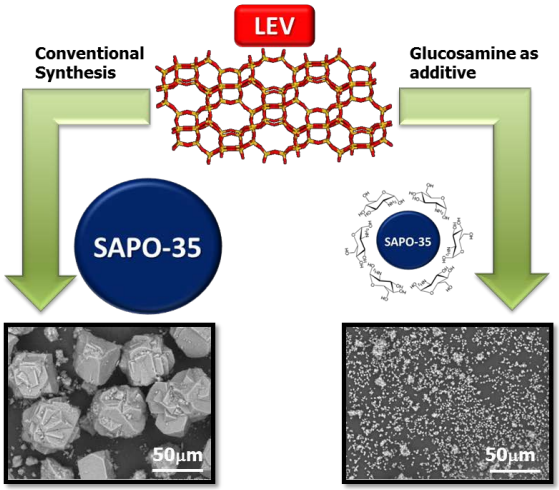
Instituto de Catálisis y Petroleoquímica, ICP-CSIC, Madrid, Spain. Tel: 915854945

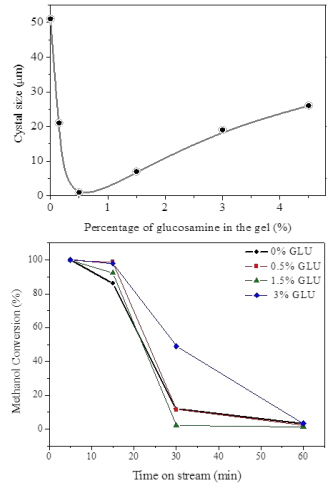
E-mail: Irene.pinilla@csic.es

The increasing demand of light olefins in the industry has renewed interest of the methanol-to-olefins process (MTO) as a route to obtain these petrochemicals from sources alternative to petroleum[1]. Some zeolitic nanoporous silicoaluminophosphates, such as SAPO-35, are active catalysts in the MTO process, raising selectivities to light olefins up to 80%. The main drawback of this catalyst in the MTO process is its rapid deactivation caused by the deposition of bulky molecules in the pore entrances and the external surface, which blocks the accessibility of the reactants to the active acid sites and the diffusion of products out of the nanopores. However, the deactivation can be restrained by modifying properly the synthesis conditions of the catalysts in order to obtain crystals with improved properties. Textural properties as well as crystal size are key parameters to enhance the stability of these kind of catalysts in the MTO process[2-3].

In this sense, we have used glucosamine as additive in the synthesis of SAPO-35 (framework type LEV) and found that it provokes an important reduction of crystal size. It is postulated that the crystal growth modifier effect of the glucosamine can be triggered by the $-NH_2$ group of the glucosamine molecules present in the synthesis gel, that can interact with SAPO-35 nuclei, surrounding them and inhibiting their growth. The synthesis of SAPO-35 under controlled conditions also favours the formation of regular cuboid crystals instead of macle ones. Furthermore, it was found that the observed outcome was strongly dependent on the percentage of glucosamine added to the synthesis gel. Crystal size decreased rapidly as glucosamine concentration increased up to 0.5% but, at higher concentrations, size reduction was progressively lower as the percentage of glucosamine added to the synthesis gel increased. Thus, it was possible to obtain SAPO-35 nanoporous catalysts with a directed crystal size.

As it is well known that crystal size is a key factor determining the deactivation of these catalysts in the MTO process, this method allows to obtain catalysts with improved stability under reaction conditions (Test conditions: WHSV=1.2h^{-1}, T=400ºC).





Notes and References

1 Chen, J.; Li, J.; Wei, Y.; Yuan, C.; Li, B.; Xu, S.; Zhou, Y.; Wang, J.; Zhang, M.; Liu, Z. *Catalysis Communications* **2014**, 46, 36-40

2 Álvaro-Muñoz, T.; Márquez-Álvarez, C.; Sastre, E. *Applied Catalysis A* **2014**, 472, 72-79.

3 Álvaro-Muñoz, T.; Márquez-Álvarez, C.; Sastre, E. *Catalysis Today* **2013**, 215, 208-215