ZEOLITE-BASED MICROREACTORS

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In recent years, microstructured reactors have become one of the most active research areas in catalysis and reaction engineering, as witnessed by several review papers on this subject [1-4]. Microstructured reactors are three-dimensional structures with inner dimensions in the range of 10 to 100 microns [3]. The main feature of microreactors is their high surface area to volume ratio, with values between 1,000 to 50,000 $m^2.m^{-3}$, while those of traditional reactors are about 100 $m^2.m^{-3}$, reaching values of 1,000 $m^2.m^{-3}$ (but only in rare cases).

In Figure 1 can be seen a typical microreactors.

These properties of the microreactors enhance mass and heat transfer and the outcome are higher selectivity, yield, and product quality, besides of higher safety conditions than conventional reactors.

Catalytic activity has been introduced into microreactors by loading noble metals (e.g. Pt, Pd) or mixtures of metals or metal oxides, normally as a washcoat with a suitable support on the microchannels. In this respect, zeolites are specially interesting candidates as catalyst supports, on account of their ability to grow as films on a variety of surfaces. Figure 2 shows seed of zeolites coated the microchannels.

In addition, the ion exchange capacity and the microporous structure of zeolites facilitate a homogeneous distribution of metal active sites. Despite of these properties, there are relatively few publications related to zeolite catalyst in microreactors.

References:

[1] A. Gavriilidis, P. Angeli, E. Cao, K.K. Yeong, Y.S.S. Wan, Chem. Eng. Res. And Des. 80 (2002)3.
[2] G. Kolb, V. Hessel, Chem. Eng. J. 98 (2004)1.
[3] K. Jähnisch, V. Hessel, H. Löwe, M. Baerns, Angew. Chem. Int. Edit. 43 (2004) 406.
[4] L. Kiwi-Minsker, A. Renken, Catal. Today 110 (2005)2.

Figures:

Figure 1.- Microreactors

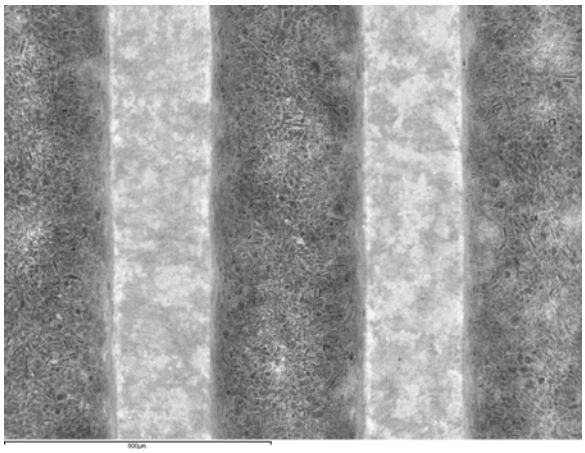

Figure 2,. Microchannels coated with seed of zeolites