

Non-hydrolytic sol-gel chemistry for the design of Si-Al-Mo metathesis catalysts.

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Light olefin metathesis is one of the most attractive reactions to upgrade abundant cheap alkenes into more demanded ones and to regulate stocks. For this purpose, MoO₃-supported heterogeneous catalysts are of great interest. With classical preparation methods (impregnation of a Mo precursor on a support and subsequent calcination) fine tuning of the textural properties of the catalyst and of the nature of the Mo surface species at the molecular level are however much difficult.

Here we report the possibilities offered by a non hydrolytic sol-gel route for the preparation of MoO₃/SiO₂/Al₂O₃ metathesis catalysts.^[1]

Xerogels were obtained in one step by reaction of MoCl₅, SiCl₄ and AlCl₃ with diisopropylether in dichloromethane. The adjunction of solvent is an efficient tool for the control of the final textural properties. Our strategy was to provoke the migration of Mo species towards the catalyst surface by applying appropriate calcination conditions on the xerogels. This effect is evidenced by XPS and TOF-SIMS measurements and leads to the production of well-dispersed Mo species as attested by XRD and Raman measurements. The resulting materials were mesoporous ($P_d \sim 12$ nm) with high specific surface area (400 to 600 m²/g) and very high pore volumes (up to 2 cm³ g⁻¹).

Various compositions were prepared in order to evaluate the effect of the Mo loading and of the Si/Al ratio on the properties of the materials and on their catalytic performances. These ternary systems are active in the self-metathesis of propylene. Specific activity is shown to be highly dependant on the MoO₃ loading but also on the Si/Al ratio. The performances of the catalysts in the self-metathesis of propylene are successfully correlated with their physicochemical properties. New insights on the nature of the metathesis active sites are also gained with this study.

1. D. P. Debecker, K. Bouchmella, C. Poleunis, P. Eloy, P. Bertrand, E. M. Gaigneaux and P. H. Mutin, *Chem. Mater.*, 2009, **21**, 2817.