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“Design of advanced nanostructured catalysts using Supercritical Fluids”

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Over the past few years, the environmental standards concerning the content in sulphur of fossil fuels have been hardening and follow this tendency. In 2004, they were of 500ppm of sulphur in the diesel in the United States of America against 15ppm today (standards in force since 2006), and Europe wishes to decrease them in 10ppm for 2008 [1]. Together with these ambitions which are clearly in line with an objective of sustainable development, oil industries also have to face another challenge: a significant share of global oil reserves is constituted by so-called heavy oils containing strong rates of pollutants such as sulphides, nitrogenous and aromatic compounds and heavy metals. These heavy oils also often contain very difficult products to hydrodesulfurize such as the by-products of dibenzothiophene [2].

Considering these two major aspects, the need for a deep hydrodesulphurization (or deep-HDS) clearly comes to light and many researches are already conducted, mainly on the development of catalysts for this reaction. The mixed oxide of general formula $Ni_xMo_{(1-x)}O_4$ holds particular attention because of its good propensity to convert the most refractory compounds [3]. An important parameter for the effectiveness of a catalyst is the specific surface (Sp) it develops. Catalysts are frequently supported on γ-alumina to increase Sp. But these materials are not inert toward the catalyst and "dilute" its active sites [4]. In this context, our team develops a line of research whose objective is to work on the synthesis of this mixed oxide in supercritical fluids (SCFs) to free itself from the support. Indeed, by simple changes in experimental conditions (temperature, pressure, synthetic environment ...), it has been shown that this process can control the characteristics of the synthesized materials and in particular their size (few nanos → few microns) [5,6].

References:

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