In situ synthesis of Aluminium Phosphate Binder from clay for FCC Catalyst Production.

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Abstract

The increasing demand of light olefins and gasoline is one of the hot topics for the petrochemical industry. Remaining raw oil quality and biomass coprocessing require a fundamental modification of the Fluid Catalytic Cracking (FCC) process in oil refineries. Especially, the catalyst modification becomes necessary for the goal of producing light olefins and naphtha from gasoil and bio-resources. It can be achieved through modification of the FCC catalyst properties, such as matrix activity and mechanical resistance. Therefore, the modification of the catalyst matrix is necessary to adjust the selectivity of the catalyst. In the last years, the use of aluminum phosphates as catalyst binders has become more relevant for the catalyst producers, because their crystal structures and chemical properties are strongly related to well-known acidic silica materials. Although their binding properties are excellent, the synthesis of appropriate and cheap binding materials is still challenging. As part of the ReCaLI Project at the TU Dresden for the reuse of FCC Catalyst of PetroVietman (PVN), this work focuses in the use of cheaper raw materials for the synthesis of this binder and its characterization.

The binder synthesis was done under hydrothermal conditions using kaolin as a cheaper aluminium source and phosphoric acid. In this system, reaction temperature and the Al/P molar ratio were tested to observe the influence of these variables over the properties of the catalyst matrix, such as porosity, crystallinity and the active surface. Therefore, this new material was characterized using TPAD, BET, XRD, TGA and laser scattering to compare it with its raw clay. The results show, that the new filler has higher acidity and specific surface area than the untreated filler, and the aluminium phosphate binder (in different structures, depending on the reaction conditions) is formed from the aluminium of the clay.

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