

## ABSTRACT

In this doctoral thesis we have studied the irradiation in the deep UV region for the activation of hydrocarbons, CO<sub>2</sub> and CO. We have demonstrated the applicability of the deep UV irradiation for activating surfaces with a high density of hydroxyl groups and we have achieved the conversion of methane, ethane, benzene, CO and CO<sub>2</sub>.

Deep UV photolysis (165 or 185 nm) of surface silanol groups leads the homolytic O-H bond breaking, generating silyloxy radicals and hydrogen atoms. Silyloxy radicals are able to activate methane and ethane through hydrogen abstraction, whereby methyl or ethyl radicals are formed. The product distribution of this radical process depends on the absence or presence of oxygen and may lead to the formation of C1 or C2 oxygenates together with light alkanes. We have studied the behavior of ZSM-5 zeolite irradiated with deep UV light in the presence of benzene or NH<sub>3</sub> H<sub>2</sub>O atmospheres.

Photolysis of CO<sub>2</sub> irradiation in the deep UV zone in the presence of H<sub>2</sub> or H<sub>2</sub>O, gives CH<sub>4</sub>. The presence of solids such as LDH increases the conversion of CO<sub>2</sub> compared with similar processes where there is no solid and irradiation is carried out in gas phase. We have developed a CO<sub>2</sub> activation process in two stages; the first one is conducted under anhydrous CO<sub>2</sub> gas with deep UV irradiation to generate CO. The second stage involves the reaction of CO with H<sub>2</sub> or H<sub>2</sub>O in gas phase or on a photocatalyst and using sunlight.

It has shown the great interest deep UV region may have to activate unreactive molecules such as light hydrocarbons and CO<sub>2</sub>.