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Innovative catalysts for the conversion of greenhouse gases (CO_2 and CH_4) from biowastes to energy and chemical

The increasing levels of CO_2 and CH_4 concentration in the atmosphere, especially due to fossil fuels combustion for energy production, agricultural activities and other industrial processes have led to severe climate changes. CO_2 reforming of methane ($CH_4+CO_2 \leftrightarrow 2H_2+2CO$) has gained increasing attention due to the conversion of these greenhouse gases into synthetic gas (syngas), which can be used for energy production or synthesis of high-value chemicals. Also, this reaction could be used for the valorization of biogas, natural gas and CO_2 waste streams. However, rapid catalyst deactivation is commonly observed in this reaction, mostly due to coke deposit on the catalyst active sites and to catalyst sintering. In the present work, the hydroxyapatite-supported nickel catalysts were synthesized and evaluated in this reaction. The catalysts presented high greenhouse gases conversion and high syngas selectivity during long periods of time (>300 h). Moreover, the comparison between these catalysts with the conventional ones highlighted the competitiveness of hydroxyapatite-supported nickel catalyst. The good performance of these catalysts was linked to their physicochemical properties, such as nickel particle size, metal-support interaction and supports basicity. In addition, the occurrence of carbon gasification reaction ($C_{(S)}+H_2O \leftrightarrow H_2+CO$) was crucial not only for lowering coke selectivity but also for increasing syngas production. Characterization of spent catalysts revealed that besides the amount of coke, the type of carbon had an influence on the catalysts deactivation. *In situ* regeneration under air flow was also performed in order to evaluate the reuse of the catalysts.

Biography

Professor Nzihou obtained his PhD degree in chemical engineering at the National Polytechnic Institute in Toulouse, France in 1994. His research interests focus on treatment processes and engineering new materials from waste and biomass. He has published about 120 papers in peer-reviewed journals and conference proceedings, and supervised 10 PhD students and 12 post-docs. Since 2001, he has received 20 significant grants from industry and governmental agencies. He is the initiator and the Chairman of the Waste Eng Conference Series dedicated to organizing conferences and seminars on Waste and Biomass Valorization.

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