Hiden Reference: AP0080
Hiden Product: HPR-20 QIC Real time Gas Analyser

Growing hydrogen expectations: embedded catalyst design for active and stable catalysts

Hydrogen as an energy vector in combination with fuel cells is one of the emerging energy solutions in terms of sustainability and low environmental impact. Sustainable H_2 production is therefore one of the key targets of current research. Recently, the Materials, Environment and Energy research group at the University of Trieste, coordinated by Professor Paolo Fornasiero investigated various options for H_2 production and purification by using a Hiden HPR-20 Quadrupole Mass Spectrometer.
http://www.dsch.units.it/~fornasiero/index.htm

The mass spectrometer was used to prove the superior thermal stability, during methane partial oxidation, of an innovative embedded $Rh@Al_2O_3$ catalyst with respect to conventional impregnated material (Figure 1).

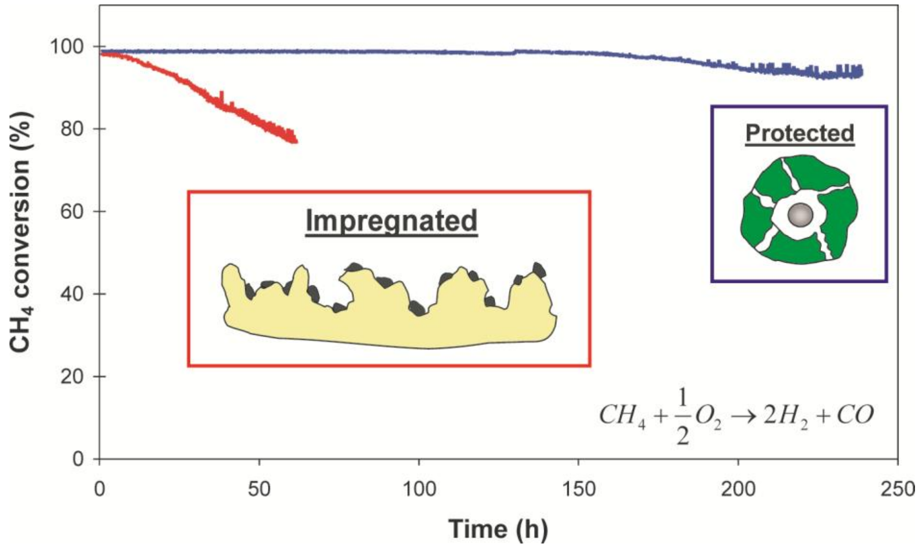

Figure 1: Methane conversion at 750°C vs reaction time over a conventional impregnated Rh(1wt%)/Al_2O_3 and a protected / embedded Rh(1wt%)@Al_2O_3 catalyst.

More recently, the same research group used the mass spectrometer to investigate methanol steam reforming and water gas shift reactions over an embedded $Pd@CeO_2$ and the preferential oxidation reaction over an embedded $Au@CeO_2$ catalyst. Furthermore, it was used to characterize an embedded $Ru@ZrO_2$ based catalyst during the ammonia decomposition reaction (Figure 2). Finally, the Hiden HPR-20 quadrupole mass spectrometer was applied to evaluate the amount and nature of coke deposited during ethanol steam reforming on $Cu/ZnO/Al_2O_3$ based catalyst (Figure 3).

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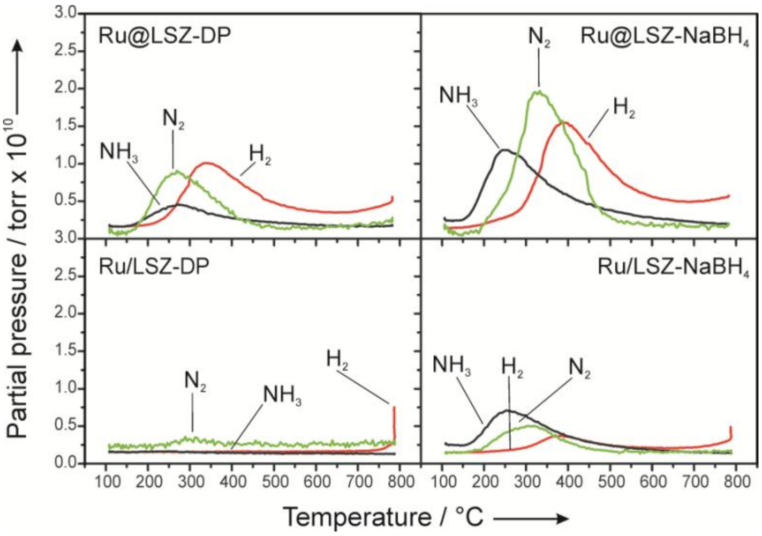

Figure 2: NH_3-TPD on embedded Ru@LSZ and impregnated Ru/LSZ catalysts.

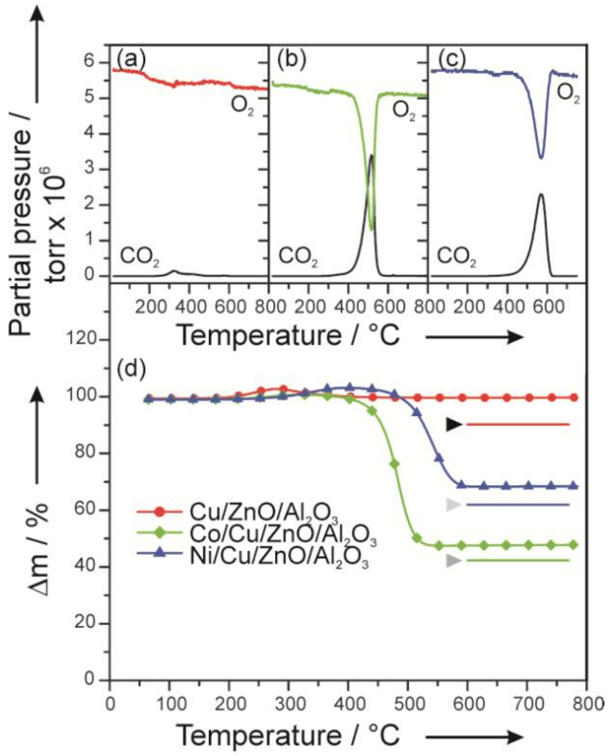

Figure 3: Coke characterisation by Temperature Programmed Oxidation (TPO) after ethanol steam reforming on Cu/ZnO/Al_2O_3-C (a), Co/Cu/ZnO/Al_2O_3-C (b) and Ni/Cu/ZnO/Al_2O_3-C (c) and TGA analysis of the same samples (d).

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Paper Reference:

B. Lorenzut, T. Montini, L. D. Rogatis, P. Canton, A. Benedetti, P. Fornasiero (2011) "Hydrogen production through alcohol steam reforming on Cu/ZnO-based catalysts" *Applied Catalysis B: Environmental* **101** (3 & 4), 397-408

Hiden Product:

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Follow the link to the product catalogue on our website for further information:
http://www.hidenanalytical.com/index.php/en/product-catalog/181-gas-analysers-qic-series/439-hpr-20-qic-atmospheric-gas-analysis-system-