

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 H₂ 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 H₂ production and purification by using a Hidden HPR-20 Quadrupole Mass Spectrometer. <http://www.dschi.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@Al₂O₃ catalyst with respect to conventional impregnated material (Figure 1).

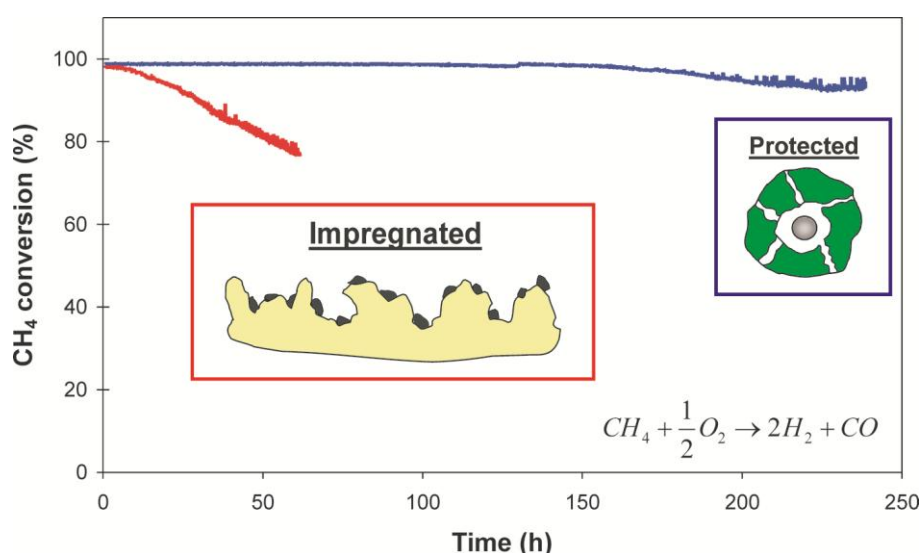


Figure 1: Methane conversion at 750°C vs reaction time over a conventional impregnated Rh(1wt%)/Al₂O₃ and a protected / embedded Rh(1wt%)@Al₂O₃ catalyst.

More recently, the same research group used the mass spectrometer to investigate methanol steam reforming and water gas shift reactions over an embedded Pd@CeO₂ and the preferential oxidation reaction over an embedded Au@CeO₂ catalyst. Furthermore, it was used to characterize an embedded Ru@ZrO₂ based catalyst during the ammonia decomposition reaction (Figure 2). Finally, the Hidden HPR-20 quadrupole mass spectrometer was applied to evaluate the amount and nature of coke deposited during ethanol steam reforming on Cu/ZnO/Al₂O₃ based catalyst (Figure 3).

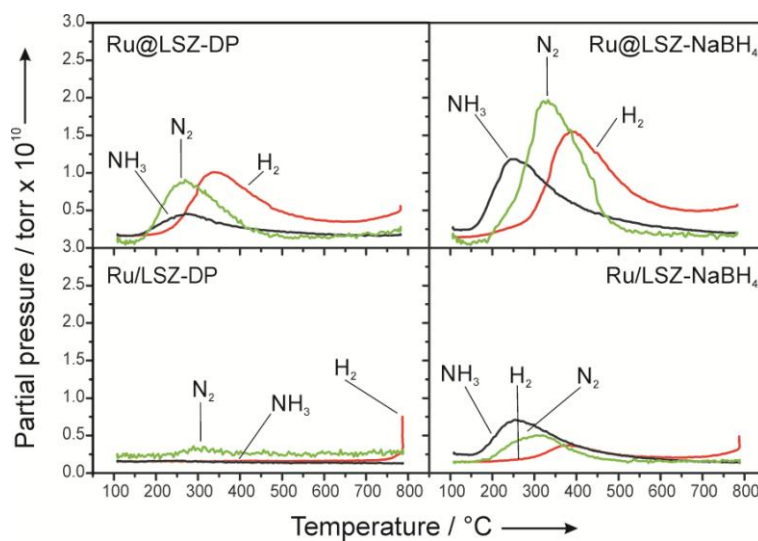


Figure 2: NH_3 -TPD on embedded Ru@LSZ and impregnated Ru/LSZ catalysts.

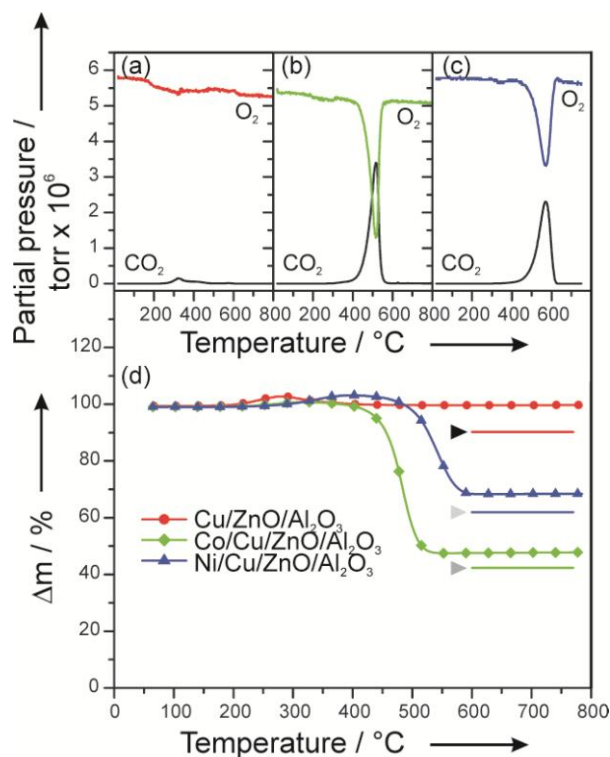


Figure 3: Coke characterisation by Temperature Programmed Oxidation (TPO) after ethanol steam reforming on $\text{Cu/ZnO/Al}_2\text{O}_3\text{-C}$ (a), $\text{Co/Cu/ZnO/Al}_2\text{O}_3\text{-C}$ (b) and $\text{Ni/Cu/ZnO/Al}_2\text{O}_3\text{-C}$ (c) and TGA analysis of the same samples (d).

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



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<http://www.dschi.units.it/~fornasiero/index.htm>



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"Hydrogen production through alcohol steam reforming on Cu/ZnO-based catalysts" *Applied Catalysis B: Environmental* **101** (3 & 4), 397-408

Hidden Product:

HPR-20 QIC Real time Gas Analyser

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->