



# **The Catalyst Group Resources**

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## ***PRESS RELEASE . . .***

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### ***Advances in Catalysis for Fuel Reforming and the Water Gas Shift Reaction (completed November 2006)***

Hydrogen has long been used for the large-scale manufacture of commodity chemicals, such as ammonia, and has now begun to be used as a clean fuel. However, most of the applications of hydrogen as a fuel will be small-scale applications such as fuel cells. These applications require significant advances in reforming technology, as the technology for large-scale reforming cannot be readily scaled down. On-board reforming, in particular, presents major challenges, due to the rapid start-up and response times that are required for commercial operation in vehicles.

In a detailed and comprehensive report which covers recent advances in three technologies that are of crucial importance for the wider use of hydrogen in fuel applications: small scale fuel reforming, biomass conversion and water gas shift catalysis, members of The Catalyst Group Resources' (TCGR's) **Catalytic Advances Program (CAP)** have exclusive access to a state of the art report. In each of these areas, the report covers the technology's application, recent developments and remaining hurdles. The report also discusses the challenges for these technologies in the commercial production of hydrogen. Entitled "***Advances in Catalysis for Fuel Reforming and the Water Gas Shift Reaction,***" the report is authored by leading industrial and academic experts and is peer reviewed. Some of the noteworthy findings in this analysis include:

- ? **Advances in Small Scale Fuel Reforming:** Progress in fuel reforming technology will come from the development of advanced catalytic reactor technology, such as microchannel reactors and membrane reactors, and better integration of fuel reformers with the complete fuel cell power system. Much of the R&D effort in reformer technology is being carried out by small companies.
- ? **Hydrogen Production from Biomass or Biomass Derived Feedstock:** Due to their high energy density and ease of handling, liquid bio-fuels, such as pyrolysis bio-oils and bio-ethanol are advantageous feedstocks for the production of on-demand hydrogen for low temperature fuel cells in transportation applications. Hydrogen rich syngas produced from biomass can be used directly without purification in high-temperature fuel cells, such as solid oxide fuel cells (SOFCs).
- ? **Advances in Water Gas Shift Catalysis:** The commercial WGS catalysts currently used in industrial processes have significant disadvantages when used for hydrogen production in fuel cells. Catalysts with very high activity are needed in order to reduce the size of the WGS reactor. The Cu/ZnO low temperature catalysts have high activity, but are pyrophoric and so cannot be used in automotive fuel cells, where the catalyst is exposed to air. Precious metal catalysts, which are not pyrophoric, have been extensively investigated as possible WGS catalysts for fuel cells. Pt/ceria catalysts, in particular, are promising because of their high

activity in WGS reactions, but their practical use may be limited by their high cost, and their long term stability under fuel cell operating conditions is uncertain.

Additional technical reports issued on a members-only basis in 2006 include: ***Advances in Catalyst Design II*** and ***Catalysis for the Upgrading of Heavy Oil***.

To view the report's complete Table of Contents, List of Figures and List of Tables, please visit <http://www.catalystgrp.com/caprogram.html>. For further information on these reports and the membership-driven **Catalytic Advances Program (CAP)**, please contact Mr. John J. Murphy ([jjm@catalystgrp.com](mailto:jjm@catalystgrp.com)) or call 215-628-4447.

*The Catalyst Group Resources (TCGR), a member of The Catalyst Group, is dedicated to monitoring and analyzing technical and commercial developments in catalysis as they apply to the global refining, petrochemical, fine/specialty chemical, pharmaceutical, polymer/elastomer and environmental industries. The Catalyst Group Resources' assessment is based on information obtained from the public domain as well as internal sources and industry interviews. TCGR's analysis will report factual information, as well as hypotheses/interpretations based on this information, in order to derive a reasonable set of expectations. Factors could cause actual results to differ from our forward-looking statements and The Catalyst Group Resources undertakes no obligation to publicly revise these forward-looking statements to reflect events or circumstances after the date hereof.*