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Abstract Formulary

Presentation type: **Oral** ✔ **Poster** ☐

Title: PGM-Nanoparticle-Containing Alumina Aerogels for Three-Way Catalyst Applications

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ABSTRACT (Space limited to 2200 characters)

Aerogels' unique blend of physical and chemical properties makes them potentially advantageous for catalytic conversion of the harmful emissions from gasoline engines that are a major source of air pollution. In automotive applications, pollutants, such as NOx, CO and unburned hydrocarbons (HC), are removed by “catalytic converters” (better known as three-way catalysts, TWCs), that convert these pollutants into less harmful species. TWCs are generally composed of a ceramic honeycomb structure (cordierite) coated with an alumina-oxide-based catalyst containing platinum group metals (PGM). Due to the high cost of PGMs (monetary and environmental), pathways for reducing PGM use are constantly sought. The application of aerogel-based catalysts to TWCs provides one such potential pathway.

Many aerogel properties are desirable for TWCs. Stability at high temperature could reduce diffusion and sintering of PGM active sites, allowing the TWC to be placed nearer to the engine, thereby reducing the time needed for the TWC to reach operating temperature and “light-off”. High surface area could result in more active catalytic sites and improve gas/solid interaction. Finally, the ability to tailor aerogel chemistry through the sol-gel process allows for the production of many types of catalytic aerogel materials.

To date, we have focused on the production of non-PGM-based aerogels for TWC activity including copper-, nickel- and chromia-alumina aerogels. These materials show TWC activity but don’t light off until ~250 °C (higher than light-off temperatures achieved with PGMs). Recently we have shifted to using aerogels as a carrier for PGM materials with the hypothesis that smaller amounts of PGMs may be required due to the aerogel’s structure. In this presentation we will report on findings to date, highlighting the synthesis methods for 0.8-1.6 wt% PGM of RhAl, PdAl and PtAl aerogels. As prepared, the materials have surface areas of 500-650 m2/g, which drops to 300-425 m2/g after heat treatment. Performance tests show that the materials have light-off temperatures for HC and CO (~ 200 °C) that are similar to the performance of a commercial TWC.