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# Petroleum asphaltenes: Don't waste the waste

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## Abstract

The United States, Canada and Mexico are now being called the "New Middle East" of their huge production of oil and gas from both conventional and shale sources. This new hydrocarbon production produces two waste materials in large quantities: Flaring natural gas and tars. The gas is typically burned away in flares because it is cheaper to burn than to liquefy and sell. A recent NASA study revealed that space stations flying over Siberia reported thousands of flaring oil wells from conventional oil wells, burning as much energy as the East Coast of the United States uses for travel every day. The same phenomenon has been reported in the western states of the United States. Flare gas is typically comprised of approximately 50% methane and 50% $CO_2$. Catalytic reforming of methane with $CO_2$ is possible using catalytic materials producing valuable hydrocarbons that are liquid at room temperature. However this reaction occurs at temperatures near 7000C. Thus, the cost of implementing this process in petroleum fields is too high. "Flare quenching" methods are now being developed using novel catalytic materials for the reforming using solar power to convert the waste to useful products. In addition, refineries that produce heavy crudes also produce large quantities of "heavy bottoms" that are used to make "road tars." These heavy bottoms contain molecules called asphaltenes. Under moderate conditions, novel catalytic materials the asphaltenes and remove sulfur and nitrogen. Interestingly, novel materials can be generated during this process. Indeed, a solar cell made with Asphaltenes has been reported. Several more interesting materials made from waste asphaltenes are anticipated to be reported in the future. Thus, there are many opportunities to use this so called waste from oil and gas production using novel catalysts; however, extensive materials research is needed to take advantage of these opportunities.

## Biography

Russell R Chianelli is currently Director of the Materials Research and Technology Institute at the University of Texas at El Paso and Professor of Chemistry, Materials and Environmental Science and Engineering. After receiving his PhD, he joined the Corporate Research Laboratories of Exxon Research and Engineering Co. in 1974. While at this laboratory he conducted research in both fundamental and applied areas of interest to the energy industry. He is recognized worldwide for his work in Transition Metal Sulfide environmental catalytic materials. This work resulted in over 130 publications and 60 issued United States patents. During this period he was active in the Materials Research Society (MRS), serving as Vice President (1989), President (1990), Past President (1991) and Counsellor (1992-1994). In 1996 he joined the Chemistry Department at the University of Texas at El Paso as Chairman and Professor of Chemistry and Environmental Sciences.

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