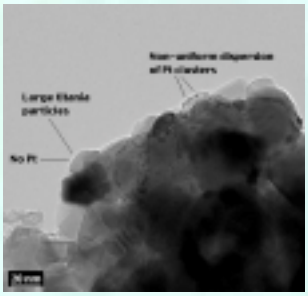
Access to Unique Research Instruments

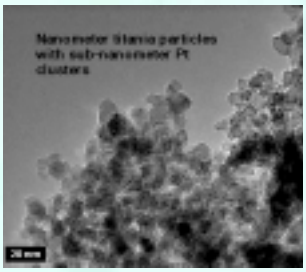
Telepresence over ESnet allows scientists from geographically distributed sites to collaborate in real time using unique instruments at DOE User Facilities

As part of its role in facilitating U.S. R&D, DOE maintains over a dozen Scientific User Facilities, which are employed by government, university and industrial researchers to solve vexing materials problems. These facilities are made accessible using telepresence collaboration carried over the network supplied by ESnet. In an industrial environment, it is essential to minimize the time needed to solve processing problems. This time is measured not only by the time to fabricate a new material but also to analyze its structure/property relationships. Remote network access to DOE User Facilities can dramatically shorten analysis time.

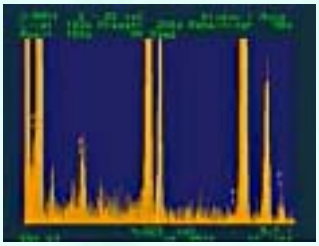
Collaboration on Catalysts Solves Industrial Problem



Original catalyst had poor performance due to a non-niform dispersion of Pt clusters on large titania powder particles.



Within one week, an improved catalyst with a better dispersion of Pt clusters on fine titania was prepared and analyzed.



High resolution analytical electron microscopy confirms that the nanoparticles are platinum clusters.

In order to reduce NOx emissions from diesel engine exhausts research scientists at Ford Research Laboratory in Dearborn, are collaborating with DOE scientists in studying new types of catalysts. One such catalyst consists of platinum clusters which are supported on titania particles located inside of the catalytic converters found on vehicle exhaust systems. To be effective, the catalyst clusters must be small and uniformly distributed on the titania particles, which also must be as small as possible. Studying these small particles requires advanced research instrumentation which is not always available at all organizations.

By using remote collaboration tools to access DOE user facilities, Ford scientists found that the platinum clusters in their catalyst were neither small enough, nor were they uniformly distributed. After modifying their processing techniques new samples were fabricated and sent to ORNL. The Ford and ORNL researchers then examined the new samples together across the Internet. This time, the clusters were uniformly distributed. However, it remained to be verified that the clusters were really platinum. The sample was forwarded to ANL, for a analysis using a different instrument. Using the Advanced Analytical Microscope at ANL and a three-way telepresence session, the researchers confirmed that the particles were indeed platinum. ESnet's role as backbone provider and its peering with commodity networks facilitated the collaboration and data sharing, allowing the scientists to accomplish in less than two weeks something which otherwise would have taken months and extensive travel.