

Super Hard and Slick Coatings Win R&D 100 Award

Researchers from the U.S. Department of Energy's (DOE) Argonne National Laboratory received a R&D 100 award, as judged by R&D Magazine, in July 2009 for developing super hard and slick coating (SSC) for increased engine efficiency and component reliability. SSC is an important step towards increasing fuel efficiency in vehicles, which helps meet the administration's goals of reducing the Nation's dependence on foreign oil and decreasing greenhouse gas emissions.

Argonne National Laboratory (ANL) began researching super slick coatings in 2005. The awards recognize the top scientific and technological innovations of the past year. ANL scientists have won 105 R&D 100 awards since they were first introduced in 1964. The Vehicle Technologies Program has received 20 awards for various technologies created in collaboration with five different laboratories, universities and industry.



Superhard and slick coatings can improve the performance of all kinds of moving mechanical systems, including engines. Friction, wear, and lubrication strongly affect the energy efficiency, durability, and environmental compatibility of such systems. As an example, frictional losses in an engine may account for 10-20 percent of the total fuel energy (depending on the engine size, type, driving conditions, and weather, for example). The amount of emissions produced by these engines is also strongly related to their fuel economy. In general, the higher the fuel economy, the lower the emissions. In fact, achieving higher fuel economy and lower emissions is one of the most important goals for all industrialized nations. SSC with its self-lubricating and low-friction nature can certainly help to increase the fuel economy of future engines.

The SSC is a designer coating: The ingredients used to make it were predicted by a crystal-chemical model proposed by its developers. In laboratory and engine tests, SSC reduced friction by 80 percent compared to uncoated steel and virtually eliminated wear under severe boundary-lubricated sliding regimes.

Tribology is the science and technology of interacting surfaces in relative motion. Tribological materials in future engine systems will be subjected to much higher thermal and mechanical loads and will be supplied with less effective but more environmentally sound lubricants in much reduced quantities. Energy saving and environmental benefits resulting from the uses of SSC are real. As of 2009, the United States consumes nearly 13 million barrels of oil per day to power motored vehicles. The total energy losses resulting from friction in these vehicles are estimated to account for about 15 percent of the fuel's energy. Therefore, if it can be reduced by one third by advanced friction control technologies like SSC, billions of dollars could be saved every year.

Because SSC allows for less friction in engines, it helps manufacturers produce more fuel-efficient vehicles. This in turn helps Americans save money at the gas pump, and boosts the American auto industry by helping manufacturers produce more appealing cars because of increased fuel efficiency.

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