

Technology breakthrough leads to greener, safer motoring

Innovative Solutions



As consumer demand for improved road safety, better fuel economy and reduced environmental impact has gained momentum, tire manufacturers have searched for affordable solutions.

The technology to produce “green” tires has been around since the early 1990s, but it was not widely adopted due to the increased cost of manufacturing. A technology breakthrough at Dow Corning Corporation may provide a solution, heralding an era of greater availability of safer, “green” automobile tires.

A life cycle assessment by the European Association of the rubber industry determined that green tires reduce the impact on human health and the environment.

Their extra resiliency in the tread improves driving safety by providing better grip on slippery roads. Studies have shown that green tires’ traction reduces stopping distances on wet and icy surfaces by 15 percent and improves overall winter driving performance by 10 to 15 percent. Tire-rolling resistance is reduced by up to 20 percent compared to an equivalent standard tire, and vehicle fuel consumption is also reduced by up to 5 percent. The tires also reduce carbon dioxide (CO₂) emissions.

“As more green tires come on the road, the amount of fuel and pollution savings could be staggering,” said Martin Harvey, Dow Corning global market leader, Materials Manufacturing Industries. “Wider use of green tires could save millions of barrels of oil per year and would also reduce carbon dioxide emissions significantly.

“Green” tires first emerged as a concept in the 1990s. Tire engineers discovered that if they used silane-treated silica instead of the traditional carbon black as a reinforcing filler in tread compounds, the tire-rolling resistance was improved. Despite this and other benefits, the higher manufacturing cost of using Innovative Solutions silane coupling agents

to produce silica-reinforced tread meant higher costs to consumers and hindered widespread use.

As a result of collaboration between the company's engineering and research experts in Europe and the U.S., Dow Corning has found a way to reduce both the amount of materials consumed and the costs in making the silane coupling agents, leading to a reduction in the cost of green tires.

The breakthrough came when Dow Corning technologists at the company's site in Barry, UK, began collaborating with researchers at the company's advanced research and development facility in Michigan, U.S.. Using phase-transfer catalysis (PTC) technology, they developed a method through which the silane needed for the silica treatment component could be made more affordably.

"Our technology has helped to reduce the cost of producing green tires, which will increase the availability of green tires; they will become more affordable and available, leading to wider adoption," Harvey continued. "This has the potential to have significant environmental and cost benefits around the world."

"We are pleased we have been able to provide this solution for tire manufacturers, which reduces their cost for green tires and helps them to make progress towards their commitments for sustainability.

The technology's environmental benefits occur in both their manufacture and use on cars. "When comparing the amount of CO₂ released in the manufacturing process with the amount of CO₂ saved during the life of the tires, the benefit is that for every ton of CO₂ produced in making the sulfido silane, 250 tons of CO₂ are saved in reduced fuel consumption by the green tires made with it – a very good trade off," Harvey concluded.

Phase-transfer catalysis, the technology that enables these cost benefits, accelerates the reaction time needed for making silanes, thus reducing manufacturing costs

and the amount of materials needed. In addition, the improved PTC technology requires no salt filtration, hazardous solvents, or solvent recovery – moving the green philosophy down the supply chain.

"PTC technology has the potential to bring the safety and fuel-efficiency benefits of green tires to all drivers by making the silane manufacturing process more streamlined," said Ken Kaufman, Dow Corning global product line manager, Silanes and Silica.

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