

# Hollow spheres made of metal

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This creates hollow spheres made of ground steel, measuring just two to ten millimeters. Credit: Fraunhofer IFAM

Producing metallic hollow spheres is complicated: It has not yet been possible to make the small sizes required for new high-tech applications. Now for the first time researchers have manufactured ground hollow spheres measuring just two to ten millimeters.

New drive technologies combined with lighter and stronger materials will make the airplanes and automobiles of the future more fuel-efficient. But a number of technical details need to be resolved first. Magnetic ball valves are one example - for them to react extremely quickly, the balls must be as light as possible, and the same applies to rapidly moving bearings. Hollow spheres made of steel represent a

solution.

Researchers at the Fraunhofer Institute for Manufacturing and [Advanced Materials](#) IFAM in Dresden, Germany, working in cooperation with hollomet GmbH Dresden have created the technology for the manufacture of rapidly reacting ball valves and bearings. "In an injection valve the movement of a ball causes the valve to open and close. The lighter the ball, the quicker it moves," explains Dr.-Ing. Hartmut Göhler, project manager at the IFAM. Until now it has only been possible to produce balls of this size as solid spheres, but a solid body is relatively heavy and therefore reacts slowly in a ball valve. "For the first time we've been able to produce [metal](#) hollow spheres in the required diameter of just two to ten millimeters. The hollow spheres are 40 to 70 percent lighter than solid ones."

The process starts with polystyrene balls which are lifted up and held by an air current over a fluidized bed while a suspension consisting of metal powder and binder is sprayed onto them. When the metal layer on the balls is thick enough, heat treatment begins, in which all the organic components, the polystyrene and the binder evaporate. The residual materials are gaseous and escape through the pores in the metal layer. A fragile ball of metal remains. This is now sintered at just below melting temperature, and the metal powder granules bind together, forming a hard and cohesive shell. The sphere is now stable enough to be ground in a machine, but the pressure must not be too high as otherwise the hollow body will deform. The wall thickness can be set to between a few tenths of a millimeter and one millimeter.

Göhler sees applications for the technique wherever a low mass inertia is required. "Hollow spheres will create applications which have not been possible up to now," Göhler states. The scientists have already produced ground spheres made of steel, other metals such as titanium and various alloys are envisaged for the future.

Source: Fraunhofer-Gesellschaft ([news](#) : [web](#))

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