

Using metals for fuel

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Did you know that in microgravity we are preparing one of the most promising fuels for the future?

Microgravity is helping to find answers and models to refine the processes needed to efficiently burn [solid fuel](#) like iron dust. Are we

witnessing the raise of a new 'Iron Age?' Could we use [metal powders](#) instead of petrol to fuel our cars?

Solid fuels are used for burning a match, lighting a sparkler on New Year's Eve as well as the fuel inside the boosters of Ariane and of other rockets. But metals such as iron can also burn, in powder form, and are entirely smokeless and carbon free.

Metals could be produced using [clean energy](#), such as from solar cells or wind turbines. That electricity is stored as [chemical energy](#) in the metal powder at energy densities that are competitive with fossil fuels. This has the potential to reduce greenhouse gasses emission globally, but a barrier to implementing this technology is the development of combustion systems that can efficiently burn the metal fuels, which requires a solid understanding of their combustion physics.

To understand the physics of metal [fuel](#) combustion, a cluster of iron powder needs to be suspended for about 30 seconds, the time needed to observe and study how a flame propagates. Researchers used sounding rockets and parabolic flights to run experiments in weightlessness and to validate existing models, yielding promising results.

The density of iron particles and the composition of gases in the combustion chamber are essential parameters, like in a petrol car engine. Microgravity allows for the study of the laws of flame propagation, to optimize parameters in industrial burner designs, and reduce impact on the environment.

These [space experiments](#) also help us understand similar phenomena, such as the spreading of contagious microbes and forest fires.

In a vote of confidence for the technique a student team at TU Eindhoven in The Netherlands worked with industrial partners to design

a metal combustion facility now installed at Swinkels Family Brewers, subsidized by the Dutch province of Noord-Brabant, used to produce steam for the brewing process.

The step to [space research](#) is closer than you might think. Get involved with spaceflight research via www.esa.int/spaceflightAO. Find out about our commercial partnerships and opportunities in human and robotic exploration via www.esa.int/explorationpartners to run your research in microgravity as well.

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