

Aluminum in the transportation sector

In order to reduce greenhouse gas emissions, automotive manufacturers are increasingly turning to aluminum, which is three times lighter than conventional steel. However, especially in the area of car body outer panels (engine hoods, door panels, trunk lids), complex designs are leading to increasing demands in terms of formability, which requires the optimization of existing aluminum alloys.

Researchers at the Montanuniversität Leoben have succeeded in developing a completely new heat treatment concept that enables better formability of conventional aluminum alloys while maintaining high strength.

Improved properties through up-quenching

Following the conventional manufacturing route for aluminum alloys, an increase in strength is mostly associated with a decrease in formability. A team of researchers led by Prof. Dr. Stefan Pogatscher from the Chair of Nonferrous Metallurgy at the Montanuniversität Leoben has successfully tackled this problem.

By the means of simulations, a completely new type of heat treatment was found, which relies on rapid heating - up-quenching - instead of the usual rapid quenching. In this context, Dr. Florian Schmid, PostDoc in the Christian Doppler Laboratory for Advanced Aluminum Alloys, explains: "Typically, aluminum alloys are heated only once in a classical heat treatment, which is followed by immediate quenching. Repeated short-term heating to an intermediate temperature can produce properties within a few hours that otherwise can only be realized over an uneconomically long period of more than a week." The new process accelerates the formation of nanometer-sized atomic clusters, which provide a unique path to high strength while maintaining good formability. In a groundbreaking article in the new Nature Research journal "Communications Materials," the researchers demonstrate the principle and capabilities of this novel process route. Based on this, the use of aluminum in the transportation sector should become even more attractive.

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