

# Scientists create unique alloy for air, rail transports

June 28 2021

---



Torgom Akopyan, senior researcher at NUST MISIS Department of Metal Forming. Credit: Sergey Gnuskov, NUST MISIS

Scientists from the National University of Science and Technology "MISIS" (NUST MISIS) in cooperation with their colleagues from the

Siberian Federal University and the Research and Production Centre of Magnetic Hydrodynamics (Krasnoyarsk) have developed a technology for producing a unique heat-resistant aluminum alloy with improved durability.

According to the researchers, this new alloy could replace more expensive and heavier copper conductors in aircraft and high-speed rail transport. The study results were published in *Materials Letters*.

Researchers have created a method for producing a unique heat-resistant, high-strength wire. The wire is made from an aluminum alloy, initially cast as a long billet, about 10 mm in diameter, in an electromagnetic crystalliser. The authors have succeeded in obtaining a thermally stable structure (up to and including 400 degrees Celsius), which is considerably superior to known aluminum [alloys](#) with thermal stability, retaining their properties up to 250–300 degrees Celsius.

"Before, alloys with such a structure were attempted to be produced using complicated and expensive technology involving ultrafast melt crystallization, pellet production and subsequent methods of powder metallurgy," Nikolay Belov, chief scientist and professor of materials science and light alloys at National University of Science and Technology MISiS, explained.

The researchers have conducted direct deformation of a long billet—rolling and drawing—without using the traditional operations of homogenization and hardening for aluminum alloys. The key feature of their proposed technology lies in the casting and annealing regimes which produce a structure of thermally stable nanoparticles containing copper (Cu), manganese (Mn) and zirconium (Zr).

"We have been able to produce a high-strength heat-resistant wire from this alloy. We are now determining its physical and mechanical

properties, and the first results are already very impressive. We are planning to patent the method of producing this type of [wire](#)," Torgom Akopyan, senior researcher at NUST MISIS Department of Metal Forming, noted.

Heat-resistant, high-strength conductivity conductors could find use in aircraft and high-speed rail transport instead of the significantly more expensive and heavier copper ones. According to the authors, the unique and cheap technology could interest producers of wrought aluminum alloy semi-finished products.

**More information:** N.A. Belov et al, Effect of cold rolling and annealing temperature on structure, hardness and electrical conductivity of rapidly solidified alloy of Al–Cu–Mn–Zr system, *Materials Letters* (2021). [DOI: 10.1016/j.matlet.2021.130199](https://doi.org/10.1016/j.matlet.2021.130199)

Provided by National University of Science and Technology MISIS

Citation: Scientists create unique alloy for air, rail transports (2021, June 28) retrieved 19 April 2024 from <https://phys.org/news/2021-06-scientists-unique-alloy-air-rail.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.