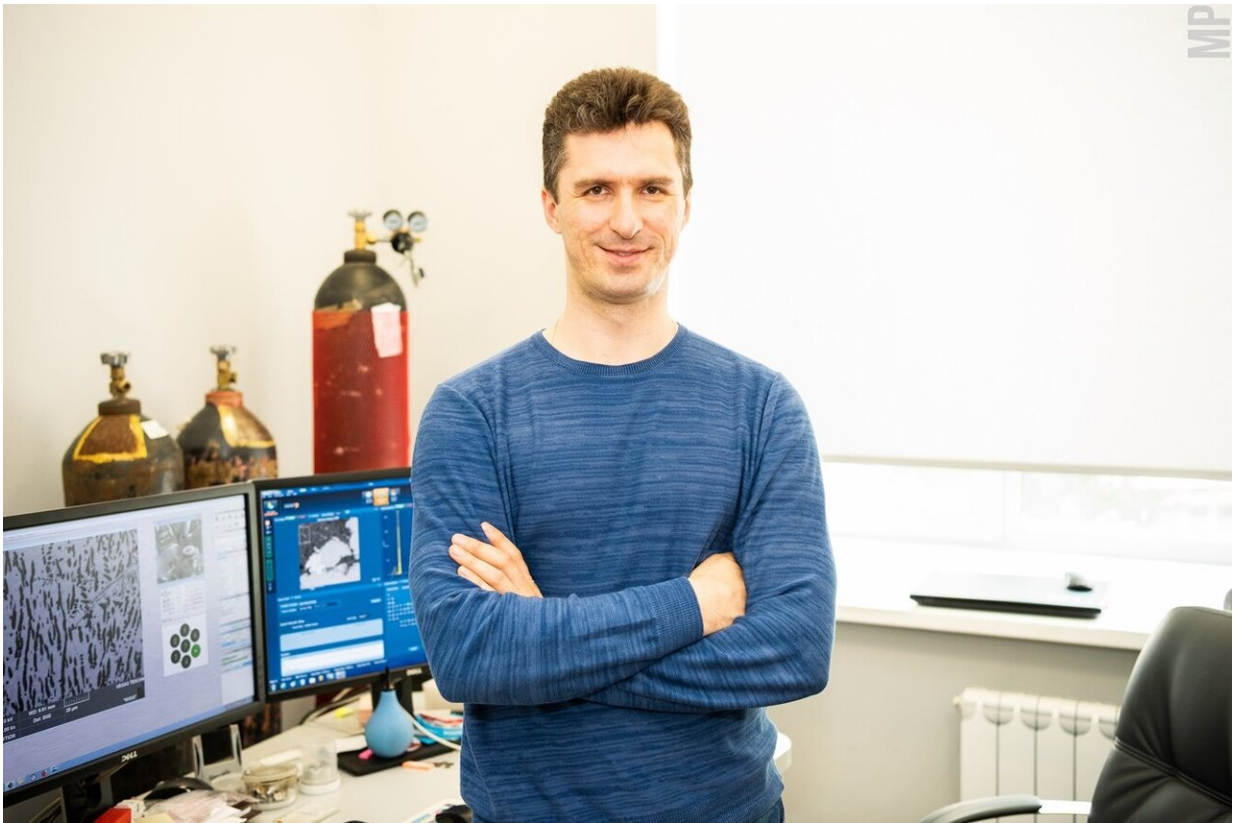


30 shades of steel: Scientists develop 'cheat sheet' for the creation of new steels

July 11 2019



Credit: MISIS

Researchers from the National University of Science and Technology "MISIS" developed a database that will help create new grades of steels. This will speed up the process of creating innovative steel grades with

specified strength and ductility at least 10 times, which will allow manufacturing car bodies of the most complex shapes. Article on the research is published in *Calphad*.

In modern [materials](#) science, the basis for the synthesis of new materials is the so-called phase state diagrams, which show the interaction of chemical elements at [different temperatures](#). Based on this information, it is possible to predict the [physical properties](#) and microstructure of alloys, and, most importantly, the conditions and technology for their production.

By studying and collecting thermodynamic parameters, scientists create a database for use in specialized programs that allow modeling new materials. For the developers it is a kind of "cheat sheet," according to which they develop a technology for creating new materials with the required properties.

Today, the production of flexible steels for car bodies, capable of bending into the most [complex shapes](#), but at the same time withstands the load on impact, is very topical for the industry. It is known that the strength and ductility of steel can be increased by adding lanthanum. However, the overall mechanism of rare earth elements' influence on steel properties remained unknown until recent times.



Credit: MISIS

Thermodynamic database which describes the interaction of iron and carbon with lanthanum additives makes it possible to accurately assume the phase composition, crystallization temperature and microstructure of the material. Such a database is created by researchers from NUST MISIS. This data allows optimizing the development of new steels, as it significantly reduces the time to search for new compositions and conduct the necessary experiments. With the database, the period of development of new steel grades can be reduced from 1 year to 1-2 months.

"In our work, we managed to experimentally confirm all the

thermodynamic data of the La-Fe-C (lanthanum-iron-carbon) system. For instance, to clarify the [chemical reactions](#) between the elements of the system we obtained about 30 alloys with different chemical compositions," Vladimir Cheverikin, paper co-author, senior researcher at NUST MISIS Center "Materials Thermochemistry," explains.



Credit: MISIS

According to the results of the research, scientists managed to calculate the exact crystallization temperature of steel-based alloys and various changes in their heat treatment.

Thus, now, if it is necessary to create new [steel](#) grades, it is enough to load the resulting [database](#) into the appropriate software and get a list of conditions that will optimize the processes, including heat treatment and pressure treatment.

More information: Masuma Mardani et al, Experimental investigation of phase transformations in the La-Fe and La-Fe-C systems, *Calphad* (2019). [DOI: 10.1016/j.calphad.2019.04.005](https://doi.org/10.1016/j.calphad.2019.04.005)

Provided by National University of Science and Technology MISIS

Citation: 30 shades of steel: Scientists develop 'cheat sheet' for the creation of new steels (2019, July 11) retrieved 26 June 2024 from <https://phys.org/news/2019-07-steel-scientists-sheet-creation-steels.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.