

# Metal innovation offers a unique, cost-effective option for plumbing and manufacturing industries

March 15 2019, by Chris Adam

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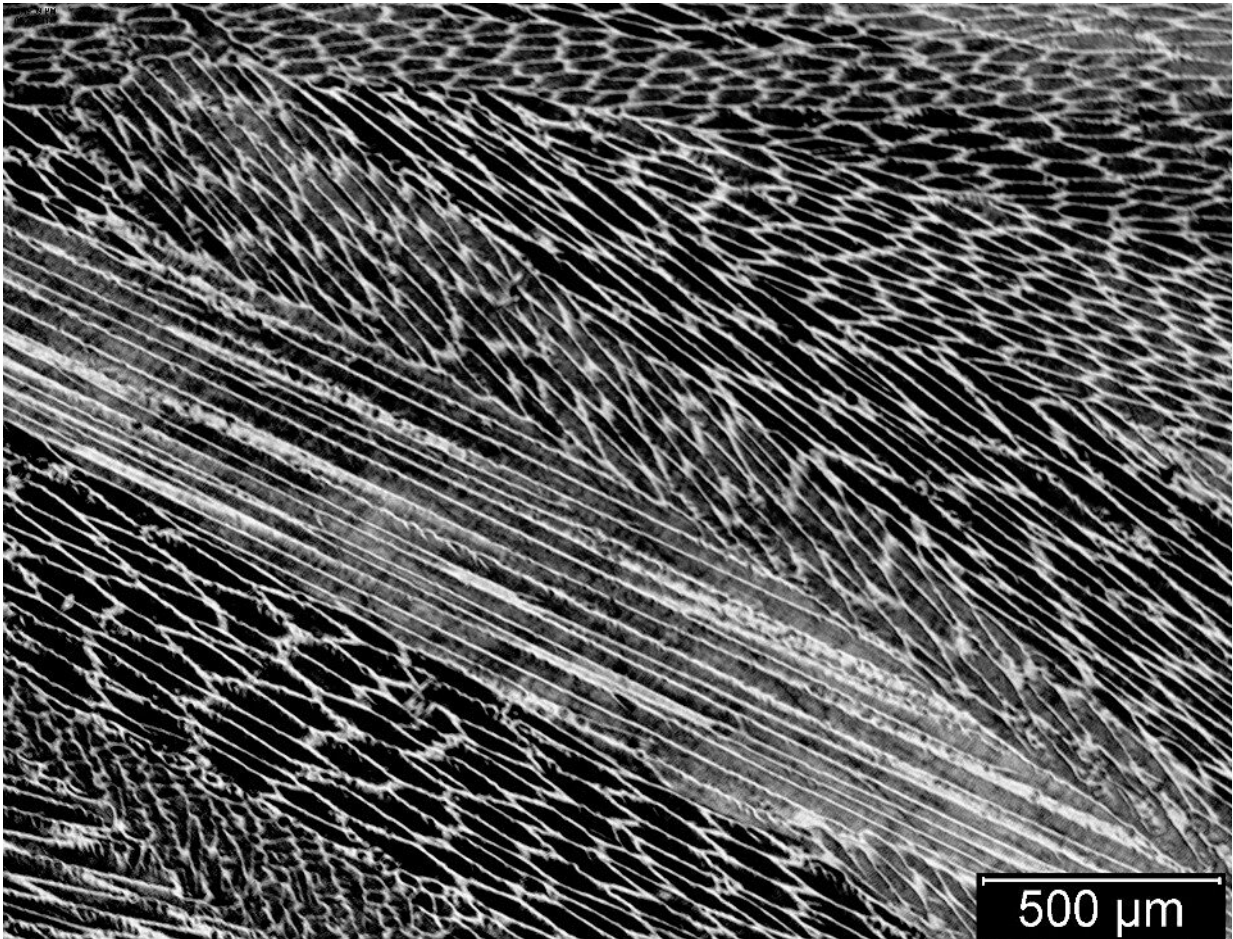
A new copper-manganese alloy innovation from Purdue University offers a unique option for the plumbing and manufacturing industries. Credit: Purdue University

A discovery made by researchers to help ensure water safety may have applications that reach far beyond plumbing. The researchers wanted to find alternative lead-free bronze alloys for use in water valves and the plumbing systems for more than 10 million homes in the United States.

The use of lead in such systems is greatly restricted in the United States because of health concerns. Purdue University's team found new copper-manganese [alloys](#) that have higher strength and better castability compared to the current lead-free alternatives.

"Our alloys have been shown to have superior overall mechanical properties compared to other cast, lead-free alternatives," said Kevin Trumble, a professor of materials engineering at Purdue and director of the Purdue Center for Metal Casting Research, who led the research team. "We are helping to meet the growing need for new alloys with superior mechanical properties, especially amid an increasing amount of government regulation requiring industries to reduce the lead content they use."

Plumbing fitting and valve manufacturers have traditionally used small additions of lead to improve machinability of the bronze alloys and to plug the continuous shrinkage porosity that develops because of their wide freezing range in casting. Those manufacturers have spent the past decade trying to find lead substitutes, such as bismuth, that are easy to use and affordable.



Purdue cast Cu-Mn alloy showing non-dendritic or cellular structure, completely free of solidification microporosity. Credit: Purdue University

"These alloys solidify over a very narrow temperature range and are completely free of microscopic shrinkage porosity and have higher strength, so thinner-walled castings can be used compared to their counterparts," Trumble said. "We have proven their effectiveness as feasible, cost-effective alternatives for [water pumps](#) and marine components, and now we are turning our attention to many other potential applications for our discovery."

The Purdue researchers are testing their alloy on various valves, fittings and fixtures outside the [plumbing](#) and marine industries. Trumble said the economic advantages of using manganese, which is a more affordable alternative to other options, has been drawing interest from manufacturers across several industries.

Provided by Purdue University

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