

# Influence of the addition of recycled copper and the casting speed on microstructure and properties of copper

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## Abstract

**Statement of the Problem:** This paper focuses on the effect of the addition of recycled copper and the effect of downward semi-continuous casting speed on crystal size and mechanical properties after casting and cold deformation. The tests proved that increasing the casting speed from 0.09 m/min to 0.22 m/min results in an improvement in the structure and a reduction in grain size (cross-sectional area from 3.221 mm<sup>2</sup> to 1.2 mm<sup>2</sup>). As a result, it causes an increase in microhardness both after casting and after cold working.

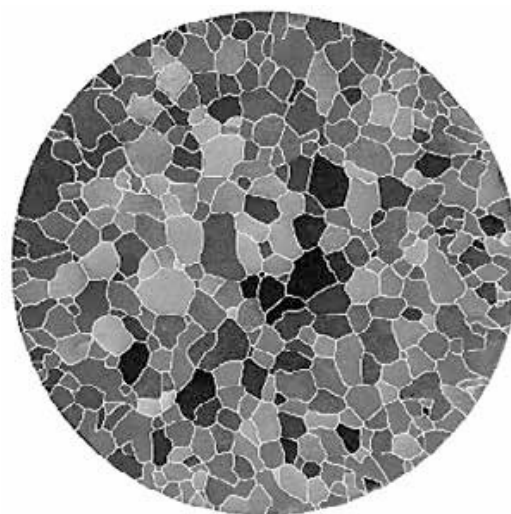
**Conclusion & Significance:** After testing the macrostructure and mechanical properties in the as-cast state and after cold working of the copper rods, the following conclusions and observations were made: Increasing the casting speed contributed to the refinement of the macrostructure of copper rod. The best effect was observed when increasing the casting speed from 0,09 m / min to 0,22 m / min. The number of crystals in the cross-section increased more than twofold, which resulted in a decrease in their size from 3,221 mm<sup>2</sup> to 1,2 mm<sup>2</sup>. The refinement of the macrostructure increased the level of microhardness and tensile strength of the tested samples. For extreme casting speeds, the microhardness increased 8 % in the as-cast state and 3 % after cold working. The tensile strength increased about 2,5 % while maintaining a similar level of yield strength and elongation.

## Information

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## Recent publications

1. Rdzawski Z, Kwaśniewski P, Głuchowski W, Łagoda M, Maleta M (2023) Research on changes in Microstructures and mechanical properties of welding caps as a result of their usage during resistance spot welding process. Archives of Metallurgy and Materials, 295-306-295-306.



The macrostructure of cast rod (diameter 25 mm).

- Góral M, Mokrzycka M, Przybyło A, Drajewicz M, Kwasniewski P, Głuchowski W (2024) The influence of plasma nitriding on the microstructure of X153CrMoV12 and X165CrV12 steels. Metalurgija 63 (1), 69-72.
- Kołacz D, Głuchowski W, Rdzawski Z, Łagoda M, Maleta M, Krukowski K, Drajewicz M (2023) The effect of the rolling process on selected properties of magnesium copper with microadditives. Metalurgija 62 (3-4), 397-400.
- Maleta M, Głuchowski W, Rdzawski Z, Łagoda M, Domagała-Dubiel J (2023) Influence of the speed of downward semi-continuous casting on the crystal size and mechanical properties of recycled copper. Metalurgija 62 (3-4).
- Łagoda M, Głuchowski W, Maleta M, Domagała-Dubiel J, Sadzikowski M (2022) Characteristics of CuCrTiAl alloy after plastic deformation. Metalurgija 61 (3-4), 831-834.

## Photograph



## Biography

Dr Wojciech Głuchowski - Director of the Department of Processing and Materials Engineering at Łukasiewicz-IMN. The manager or contractor of over 60 research and development projects, author or co-author of 12 expert opinions from industry, 5 patents, 5 patent applications, 1 license, 1 implementation and 12 awards and medals for developed solutions and inventions..

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