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ABSTRACT:

Exploring the Limits of Modern Electro-Conductive Composites

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Given by its excellent thermal and electric conductivity, copper is widely used for numerous applications. However, the major drawback of pure copper is its low strength. Advantageously, the mechanical properties can be increased without compromising the electric conductivity by introducing additional elements and second phases, or applying optimized deformation and thermomechanical processing.

Laminated or clad composites typically consist of (at least) two different metals, the combination of which provides the final product with properties superior to those of the individual components [1]. Copper composites strengthened with dispersions of oxide particles (oxide-dispersion-strengthened, ODS) are worth studying, too, for their possibility to increase the mechanical properties remarkably, without significantly affecting the electric conductivity. Copper-carbon composites are electro-conductive materials with ever increasing popularity, featuring favourable electric conductivity and advantageous mechanical properties [2].

Generally, the finer the grains within the material, the higher the provided strengthening effect. Therefore, strengthened (ultra)fine grained composites featuring distributions of reinforcing elements can advantageously be prepared by thermomechanical processing, by unconventional processing methods, or by direct consolidation of fine powder mixtures. This contribution aims to provide an insight into the possibilities and limits of fabrication of modern electro-conductive copper-based composites.

References

[1] Kocich, R., Kunčická, L., J Alloys Compd 2023, 953, 170124.
[2] Chen, F., et al., Carbon, 2016, 96, 836–42.