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Finding enhanced thermoelectric properties in the combination of natural and synthetic tetrahedrites

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We ought to seek and develop a more sustainable future while continuously increasing our knowledge in order to evolve as a society. Nowadays, we are facing several challenges regarding energy's demand, thus the search for newer and more efficient methods for supplying greener energy keeps growing.

Belonging to the sulfosalt mineral group and being mostly composed of copper and sulphur, tetrahedrites are natural occurring thermoelectric materials, being considerate as a viable alternative to the commonly employed composites that possess expensive and hazardous elements. Moreover, tetrahedrite properties and performance can be enhanced.

The aim of this work was to find sustainable and suitable materials to be applied as thermoelectrics, while increasing the valorisation of natural resources. Hence, a comparative study of the thermoelectric properties (Seebeck coefficient and electrical resistivity) between synthetically doped tetrahedrites, $\text{Cu}_{12-x}\text{M}_x\text{Sb}_4\text{S}_{13}$, with $x = 0.5$ and 1 ($M = \text{Fe}, \text{Zn}$), and the combination of undoped synthetic tetrahedrite with natural mineral samples, from two different collecting sites (Neves Corvo and Barrigão mines, Portugal), was done.

X-ray powder diffraction (XRD) and scanning electronic microscopy with energy dispersive spectroscopy (SEM-EDS) were used to verify the presence of tetrahedrites in the samples. Additionally, it was observed the effects of the thermal treatment in the thermoelectric properties on selected samples.