

# Quantification of Electrical Resistivity of Internal Interfaces in Alloys

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## Abstract

A significant amount of energy dissipation in nanomaterials and devices is associated with electron scattering at internal interfaces, such as phase-boundaries between an electrical contact and a functional alloy, or simply – grain boundaries. Quantification of the interfaces' electrical resistivity is critical to understand and monitor the material's performance. Still, assessing the interfacial resistivity values is challenging due to (i) abnormal electrical field distribution developed in a heterogeneous materials system, (ii) low variations in resistivity in respect to its surrounding medium, and (iii) spatial separation well-defined defects. The talk will demonstrate the key features to extract an interface resistivity of an individual interfacial segment, through combining experimental techniques, finite elements simulations, and analytical modelling. Novel results on several materials systems will be discussed, *e.g.*, pure and alloyed copper, Heusler alloys, and interfaces between metals. The electrical measurements are performed *in-situ* SEM; and are correlated with thermodynamic excess values and microstructural parameters revealed by EBSD, TEM, APT, and MD simulations. This research contributes to understanding the resistivity-structure relations in individual defects and aims towards extending the defect engineering to a new horizon.

## Short Biography



Dr. Hanna Bishara is Senior lecturer and Principal investigator at Materials Science and Engineering Department in Tel-Aviv University (TAU). He is the head of Defects and Internal Interfaces Lab since 2022 and an external group leader at Max-Planck-Institut für Eisenforschung (MPIE). The mission of Bishara's work is to improve electrical properties of alloys and increase devices' efficiency by knowledge-based defect engineering, while maintaining their mechanical robustness. Dr. Bishara performed his postdoctoral at MPIE (Germany), where he developed local electrical characterization techniques to probe the properties of microstructural defects at micron and sub-micron scales for bulk and thin film materials. Bishara completed his PhD and MSc at materials science and engineering in Technion in the field of dielectric nanocrystals. He holds BSc in Physics and Materials Science from the same institute. During the first year of Bishara in TAU, he won several grants including ISF, Minerva, Alon, and industry collaborations.