

ÇUKUROVA UNIVERSITY

**INTERNATIONAL CONFERENCE ON CONDENSED MATTER AND MATERIAL
SCIENCES**

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<http://iccm2019.cu.edu.tr>

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Javier CAMPO
Juan B.Carda CASTELLO
Adrian CRISAN
Tolga DEPÇİ
Yüksel ERGÜN
Ramazan ESEN
Ali GENCER
Oğuz GÜLSEREN
Samir KHENE
Andrei KAVALEUSKI

Xerman de la Fuente LEIS
Kemal ÖZTÜRK
Sultan ÖZTÜRK
Halime Ö.PAKSOY
Shahed RASEKH
David Muñoz-ROJAS
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Yoshihiko TAKANO
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I-11

New guidelines for oxide thermoelectrics: redox tuning and controlled interactions

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Development of thermoelectrics for high-temperature applications imposes several essential requirements on the material properties. In some energy-conversion scenarios the cost and thermal stability requirements may dominate over efficiency issues, making abundant, high-temperature-stable and low-toxic oxides an interesting alternative TEs. The talk will feature some promising strategies to design performing oxide-based thermoelectrics. Particular attention will be given to the approaches where the inherent redox flexibility of oxides is invoked for tailoring the TE properties through in-situ formation of nanocomposites with enhanced performance. Another strategy is based on a self-forming nanocomposite concept for ZnO-based thermoelectrics, where a controllable interplay between exsolution of the nanophases and modification of the host matrix suppresses the thermal transport, while imparting the high electrical performance. The mechanisms behind the observed enhancement in thermoelectric properties and specific pathways towards high TE performance in oxides will be proposed and discussed.

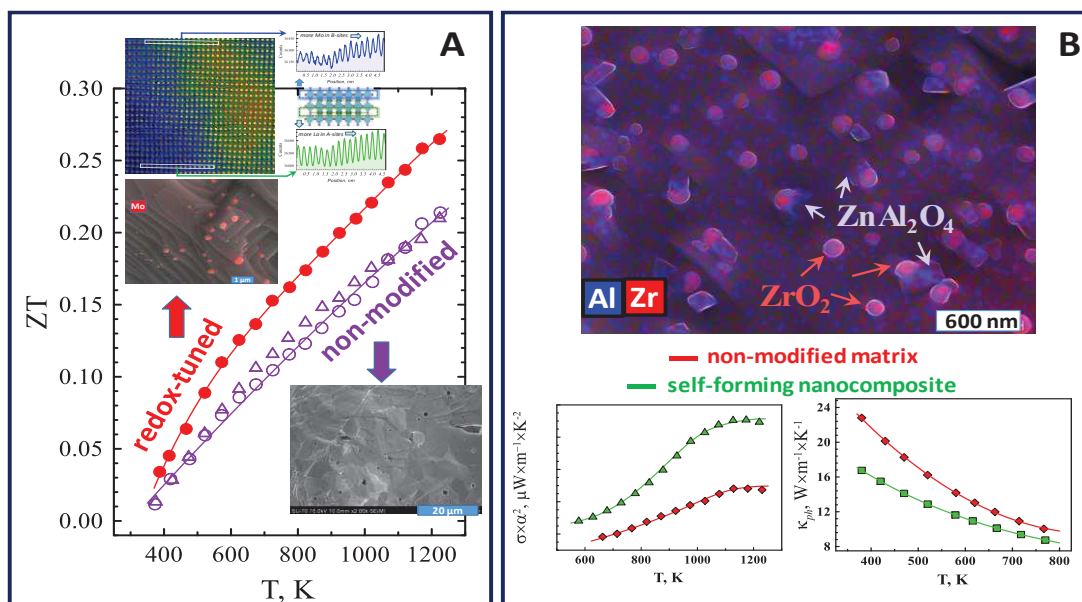


Fig. 1: Comparison of the thermoelectric efficiency (ZT) in non-modified and redox-tuned $SrTiO_3$ -based materials, and corresponding SEM/EDS and STEM -HAADF images (A). Representative microstructure and chemical mapping results for $Zn(Al,Zr)O-ZnAl_2O_4-ZrO_2$ nanocomposite and comparison of the power factor ($\sigma \times \alpha^2$) and thermal conductivity (κ_{ph}) in nanocomposite and non-modified matrix (B).

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