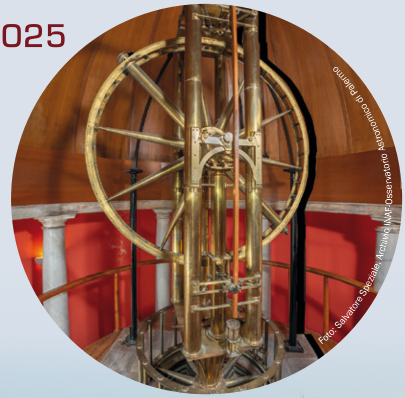
Società Italiana di Fisica

111° CONGRESSO NAZIONALE

Palermo, 22-26 settembre 2025



Università degli Studi di Palermo

INTERNATIONAL YEAR OF Quantum Science and Technology

Polo Didattico del Campus dell'Università di Palermo

A cura di Barbara Alzani, Marco Bellacosa e Giovanna Bianchi Bazzi
Redazione dei testi a cura di Barbara Ancarani e Marco Bellacosa
Progetto grafico a cura di Simona Oleandri

Società Italiana di Fisica

ISBN: 978-88-7438-144-9

111° CONGRESSO NAZIONALE

Società Italiana di Fisica

Palermo, 22-26 settembre 2025

Polo Didattico del Campus dell'Università di Palermo

Structure analysis and electric performances evaluation of Cu:Sb2Se3 solar cells.

Ferruggia Bonura S. (1), Barbarossa S. (1), Bronzoni M. (2), Spaggiari G. (2), Pattini F. (2), Barrantes J. J. N. (3), Buffolo M. (3)(5), De Santi C. (3), Trivellin N. (3)(4), Meneghini M. (3)(5), Cannas M. (1), Agnello S. (1)
(1) *Dipartimento di Fisica e Chimica, Università di Palermo*
(2) *CNR, Istituto dei Materiali per l'Elettronica ed il Magnetismo, Parma*
(3) *Dipartimento di Ingegneria Informatica, Università di Padova*
(4) *Dipartimento di Ingegneria Industriale, Università di Padova*
(5) *Dipartimento di Fisica e Astronomia, Università di Padova*

Antimony selenide (Sb_2Se_3)-based solar cells are emerging as efficient and sustainable photovoltaic devices, with a theoretical conversion efficiency of 32.2%. In this work, Cu-doped Sb_2Se_3 thin films were deposited on Fluorine-doped Tin Oxide (FTO) substrates using Pulsed Electron Deposition (PED), starting from Sb_2Se_3 targets with 5 at% Cu. Alongside complete solar cells, single layers of each component were deposited on dedicated substrates for individual analysis. Electrical performance was evaluated through current-voltage (IV) and external quantum efficiency (EQE) measurements under dark and illuminated conditions. To investigate defects and recombination dynamics, steady-state and time-resolved photoluminescence spectroscopy was conducted across multiple excitation wavelengths. Key results on device performance and optoelectronic properties will be presented. This work has been developed in the framework of the project Network 4 Energy Sustainable Transition - NEST, code PE0000021, CUP B73C22001280006, Spoke 1, funded under the National Recovery and Resilience Plan (NRRP), Mission 4, by the European Union - NextGenerationEU.

Polarons in $Er_2Ru_2O_7$: an obstacle to metallic altermagnets.

Reticcioli M. (1), Radaelli P. (2), Stroppa A. (1)
(1) *CNR-SPIN L'Aquila*
(2) *University of Oxford, UK*

Altermagnets, a novel class of magnetic materials, bridge the gap between conventional antiferromagnets and ferromagnets by hosting spin-split electronic structures without net magnetization. These materials hold promise for spintronic applications due to their unique symmetry-driven properties. In this work, we explore altermagnetism in the oxide semiconductor $Er_2Ru_2O_7$, which exhibits a rare double altermagnetic ordering arising from the Er and Ru magnetic sublattices. Using density functional theory, we investigate the impact of doping on the magnetic properties. Our findings show that while the Er sublattice demonstrates remarkable robustness against p-doping, the Ru sublattice undergoes significant changes. Notably, excess electrons and hole lead to formation of polarons, which hinder any doping-induced transition towards metallic phases. These results highlight the intrinsic difficulty in achieving metallic altermagnets crucial for spintronic applications due to the formation of polaronic states that localize charge carriers and suppress metallicity.

Pressure induced multigap superconductivity in HgS.

Tresca C. (1), Forcella P.M. (1), Sanna A. (3)(4), Profeta G. (1)(2)
(1) *Dipartimento di Scienze Fisiche e Chimiche, Università degli Studi dell'Aquila*
(2) *CNR-SPIN c/o Dipartimento di Scienze Fisiche e Chimiche, Università degli Studi dell'Aquila*
(3) *Max-Planck-Institut für Mikrostrukturphysik, Halle, Germany*
(4) *Institut füur Physik, Martin-Luther-Universität Halle-Wittenberg, Halle, Germany*

Mercury chalcogenides are a class of materials that exhibit diverse structural phases under pressure, leading to a range of exotic physical properties, including topological phases and