MATERIALS SCIENCE

UNIVERSITY OF ROME
TOR VERGATA

MATERIALS SCIENCE SEMINAR
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Department of Physics
Grassano room

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Epitaxial Growth and Ultrafast Dynamics of Phase Change Materials Based on GeTe-Sb_2Te_3 Alloys and Superlattices

Phase-Change Materials, mainly represented by GeTe-Sb_2Te_3 (GST) alloys, are used for high-density data storage in optical media and for solid-state non volatile memory thanks to the rapid and reversible transformation between the amorphous and crystalline states, which display large differences in electrical and optical properties. In addition to the amorphous-to-crystalline transition, experimental results evidenced a Metal-Insulator Transition (MIT) attributed to Ge/Sb vacancy disorder in the crystalline phase.

Here we make use of fundamental advance in the fabrication by molecular beam epitaxy of GST alloys and superlattices with out-of-plane stacking of ordered vacancy layers. We assess the degree of vacancy ordering by X-ray diffraction and explicitly correlate it with the MIT by means of electrical transport.

Recently, it has been shown that memories based on superlattices of phase change materials display improved functional properties; nevertheless, their switching mechanism is still debated in literature. I will offer new insights, obtained using Terahertz-based ultrafast dynamic studies, which might pave the way to the clarification of such mechanism.