FACOLTÀ DI SCIENZE MATEMATICHE, FISICHE E NATURALI
DIPARTIMENTO DI MATEMATICA E FISICA "NICCOLÒ TARTAGLIA"
INTERNATIONAL DOCTORAL PROGRAM IN SCIENCE

Early-stage dynamics of metallic droplets embedded in the nanotextured Mott insulating phase of V_2O_3

Introduce:
PhD student Laura BIGNOTTI
Università Cattolica del Sacro Cuore

Interviene:
PhD student Andrea RONCHI
KU Leuven

Abstract

Unveiling the physics that governs the intertwining between the nanoscale self-organization and the dynamics of insulator-to-metal transitions (IMT) is key for controlling on demand the ultrafast switching in strongly correlated materials and nano-devices. A paradigmatic case is the IMT in V2O3, for which the mechanism that leads to the nucleation and growth of metallic nano-droplets out of the supposedly homogeneous Mott insulating phase is still a mystery. Here, we combine X-ray photoemission electron microscopy and ultrafast non-equilibrium optical spectroscopy to investigate the early stage dynamics of isolated metallic nano-droplets across the IMT in V_2O_3 thin films. Our experiments show that the low-temperature monoclinic antiferromagnetic insulating phase is characterized by the spontaneous formation of striped polydomains, which are intrinsic to martensitic transformations. The insulating domain boundaries accommodate the birth of metallic nano-droplets, whose non-equilibrium expansion can be triggered by the photo-induced change of the 3d-orbital occupation. We address the relation between the spontaneous nanotexture of the Mott insulating phase in V_2O_3 and the timescale of the metallic seeds growth. We speculate that the photoinduced metallic growth can proceed along a non-thermal pathway in which the monoclinic lattice symmetry of the insulating phase is partially retained.

Seminario

Martedì 16 aprile 2019
Sala Riunioni, ore 15.30
Via dei Musei 41 - Brescia

International Doctoral Program in Science@Università Cattolica del Sacro Cuore

Corso di Dottorato in Ingegneria Meccanica e Industriale@Università degli Studi di Brescia

I-LAMP
Interdisciplinary Laboratories for Advanced Materials Physics

KU LEUVEN

PhD Course RIMI

UNIVERSITÀ CATTOLICA del Sacro Cuore