"Solid State Physics" Group

- Artificial diamond
- 2D materials
- Superconductors & oxide materials
- Bio-inspired materials and metamaterials

http://www.solid.unito.it/index.html

Superconductors & Oxide Materials

Oxide nanopatterning and electroforming

- X-ray nanobeam
- Current deviation with no material removal
- Josephson device

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Bio-inspired materials and metamaterials

1) Adhesion and friction of bioinspired structured surfaces
2) Fracture mechanics models and experiments
3) Elastic waves and metamaterials

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Thesis subjects

Experimental

- Oxide nanopatterning by means of synchrotron radiation nanobeams
- Oxide electroforming

Modeling

Interaction effects between X-rays nanobeams or magnetic fields and materials:

- mesoscale: analytical models / FEM / Monte Carlo
- atomic scale: Ab initio code

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FEM : magnetic shielding induced by superconducting and ferromagnetic materials

FEM : heating induced by nanobeam

AB INITIO: energies in superconducting oxides

Monte Carlo : oxygen displacement induced by X-rays nanobeam

Thesis subjects

1) Adhesion and friction of bioinspired structured surfaces
- Gecko hierarchical fibrillar structure
- Spring-block model

2) Fracture mechanics
- Nacre microstructure
- Crack evolution in composite structure
  - Design of beam-like structures with sacrificial elements
  - 3D printing and mechanical tests

3) Elastic waves and metamaterials
- Spider web
- 3-D printed reticular structure
- Lightweight structures for low-frequency vibration damping
- Large scale metamaterial shields for seismic protection

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