



# PhD in FISICA / PHYSICS - 40th cycle

**THEMATIC Research Field: EXCITED STATE DYNAMICS IN ALL-OXIDE AND CARBON NANOWIRES FOR ADVANCED APPLICATIONS**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1300.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<b>Motivation and objectives of the research in this field</b>	<p>The research addresses the goal of investigating the photo-physical and optoelectronic properties of novel cheap and environmentally friendly materials for advanced applications including highly efficient solar cells, electronic devices or energy storage systems. The materials considered will be carbon-based wires and all-oxide nanowires in core-shell p-n structure. In particular, the focus will on excited states reached by light absorption. It is important to note that photo-excited state evolve on very short time scale, down to femtoseconds, thus time-resolved investigation is required. Main objectives will be the disclosure of the response to light irradiation, the photo-physical properties, and the excited state behaviour; these are key information for applications in opto-electronic devices. The objectives are in the framework of funded European and National projects including PRIN 2022 PNRR NanoSolar, EIC Transition KEEPER and MUR FISA APPEAL .</p> <p><a href="http://www.esplora.polimi.it">www.esplora.polimi.it</a></p>
<b>Methods and techniques that will be developed and used to carry out the research</b>	<p>The research activity is based on experimental work and data analysis. The experimental part will be mainly based on ultrafast spectroscopy, by pump-probe technique with time-resolution down to 10 fs. The setup available at the Department of Physics, with pump pulses tunable from near-IR to UV and broadband white-light probe, enables a comprehensive analysis of all photo-physical phenomena from light absorption to charge collection. Other material</p>



	<p>characterization techniques will be used, such as UV-vis absorption and Raman spectroscopy, available at Nanolab of Energy Department. Carbon wires will be fabricated by physical methods such as pulsed laser ablation in liquid (PLAL) at Nanolab. Data analysis will be performed by simple mathematical tools. Finally. study of published literature will be also part of the work.</p>
<b>Educational objectives</b>	<p>Education of people to be "launched" in the world of research and technology in the field of physics and engineering of materials, able to manage interdisciplinary issues, perform and interpret complex experiments and produce new equipments. In particular, the PhD student will be trained both in ultrafast spectroscopy and in sample preparation, by a group with long standing experience in the field and they will take advantage of state-of-the-art laboratories.</p>
<b>Job opportunities</b>	<p>The PhD research activity involves different areas, such as experimental work, data analysis, numerical modeling, teamwork, public speeches. All the acquired skills are appreciate for future in academia, or for highly qualified positions in a wide range of industries related with production, development and use of materials .</p>
<b>Composition of the research group</b>	<p>3 Full Professors 5 Associated Professors 8 Assistant Professors 10 PhD Students</p>
<b>Name of the research directors</b>	<p>G.Cerullo, M.Zavelani-Rossi, C.Casari</p>

<b>Contacts</b>	
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<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--



Scholarship Increase for a period abroad	
Amount monthly	650.0 €
By number of months	6

**Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information**

**Educational activities:** Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences). Financial aid per PhD student per 3 years: max 5.300,25 euros per student.

**Teaching assistantship:** There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

**Computer and desk availability:** individual or shared use computer and desk