



# PhD in INGEGNERIA DEI MATERIALI / MATERIALS ENGINEERING - 37th cycle

**THEMATIC Research Field: HIGH PERFORMANCE PHOTOPOLYMERS FOR HOLOGRAPHIC  
OPTICAL ELEMENTS**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1325.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

## Context of the research activity

### Motivation and objectives of the research in this field

Holographic Optical Elements (HOEs) are becoming widespread devices in different technological fields, such as automotive (lighting systems), augmented reality (smart goggles, displays), astronomical and spectroscopic instrumentation (dispersing elements). The key element of such devices is the photosensitive material in which the holographic pattern is transferred. Among the existing materials, photopolymers are the most interesting and promising ones, thanks to their high light sensitivity, the self-developing feature (they don't need a wet chemical treatment to obtain the hologram after the light exposure) and to the possibility to widely modify their chemical composition to achieve the target performances. This PhD project aims at developing innovative photopolymers with enhanced performances in order to design and manufacture efficient HOEs to be used in the field of astronomical instrumentation.

### Methods and techniques that will be developed and used to carry out the research

The approach consists in the optimization of the writing chemistry, i.e. through the design of new monomers with high refractive index and the selection of appropriate binders. Such components will be characterized and combined in the final holographic photosensitive material. Different strategies for transferring the pattern, such as direct laser writing and holographic exposure, will be employed and optimized in order to have a high fidelity reproduction of the holographic pattern.



<b>Educational objectives</b>	This PhD project aims at develop innovative materials in a multidisciplinary context. The objective is to acquire specific expertise in the field of holographic materials through a combination of chemical, physical, engineering skills. Another object is to develop a common language between the stakeholders involved in the project with different backgrounds.
<b>Job opportunities</b>	The field of photopolymers and holographic materials is in large expansion and holographic devices are becoming more and more important in many markets, such as automotive and augmented reality devices. Different companies work on the development of both the materials and the devices. There are therefore many professional opportunities for a qualified job and the outlook is positive.
<b>Composition of the research group</b>	0 Full Professors 1 Associated Professors 5 Assistant Professors 2 PhD Students
<b>Name of the research directors</b>	Andrea Bianco

<b>Contacts</b>
Andrea.bianco@polimi.it, +39-02-72320460

<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>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	564.01 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p>Confidentiality:</p> <p>since this is a thematic scholarship, the management of Confidential Information, Results and their publication is subordinate to the restrictions agreed upon with the funding company. Upon acceptance of the scholarship, the beneficiary must sign a specific commitment.</p>



Educational activities (funding for participation in courses, summer schools, workshops and conferences) - financial aid per PhD student per year:

1st year: -

2nd year: about 1.500 euros per student

3rd year: about 1.500 euros per student

Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD student:

There are various forms of financial of 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 regulation.