



# PhD in CHIMICA INDUSTRIALE E INGEGNERIA CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 40th cycle

**THEMATIC Research Field: DEVELOPMENT OF NEW MONITORING STRATEGY TO  
CHEMICALLY CHARACTERIZE ODOROUS EMISSIONS**

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

**€ 1400.0**

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**

The chemical characterization of odorous emissions remains a challenging topic. In addition, considering the new requirements introduced in the Italian legislation (Linee Guida del Ministero, Decreto Direttoriale MASE, n. 309 del 28.6.2023), a fundamental step in the sampling process of odorous emissions is the evaluation of emission concentration variability during sampling. Due to the current impossibility of continuous monitoring of odour concentration (Cod), it is suggested to monitor the variability of emissions with continuous analytical instrumentation. However, the choice of this instrumentation is extremely vague.

Therefore, the objective of this research in the context of odour characterization is to investigate and evaluate techniques for monitoring and chemically characterizing odorous emissions, with the aim of identifying new analytical strategies for field monitoring of odorous emissions. The evaluation will be based on the chemical analysis of odorous emissions conducted with speciation analysis, particularly GC-MS, to assess the nature of the compounds present in the emissions and evaluate possible solutions for continuous monitoring.

Firstly, the study will begin with an investigation of the currently available analytical techniques and their application in various real emission scenarios (e.g., emissions from combustion stacks, biofilters, hydrocarbon



	<p>tanks, natural gaseous emissions, etc.). This preliminary investigation aims to evaluate the applicability of the available analytical techniques to identify the chemical composition of the emissions in the field. This will be useful to:</p> <ul style="list-style-type: none"> <li>•Evaluate the chemical composition of odours in a predictive manner;</li> <li>•Continuously monitor emissions of VOCs or specific tracers of odour sources.</li> </ul> <p>After this preliminary investigation, the research will focus on studying possible analytical strategies for monitoring and chemically analyzing odorous emissions from industrial plants</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>Analytical techniques, whether commercially available or developed to meet specific analytical requirements, will be used and implemented during the research. In particular, for the preliminary investigation of the species present in the emissions, a customized gas chromatography (GC) analysis will be conducted. This preliminary step will help identify the molecules truly associated with odour nuisances.</p> <p>After identifying the compounds closely linked to malodours, possible analytical solutions for field monitoring will be explored. The preliminary applicability of portable instruments for monitoring emissions variability (e.g., FID and PID) will be investigated. Based on the obtained analytical results, new analytical solutions will be selected and developed on a <i>case-by-case</i> basis.</p>
<p><b>Educational objectives</b></p>	<p>During this research period, the student will be able to understand and conduct complex investigation, combined the instrumental performance, obtained results and the industrial process under study.</p>
<p><b>Job opportunities</b></p>	<p>Recent PhD graduates in this research field can find job opportunities both in an academic context and in companies, where knowledge of this new pollutant is increasingly in demand (in Italy and abroad).</p>



<b>Composition of the research group</b>	1 Full Professors 1 Associated Professors 8 Assistant Professors 6 PhD Students
<b>Name of the research directors</b>	Prof.ssa Selena Sironi

<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>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	700.0 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p><b>Individual budget for research</b> (about 5.700 euro): 1st year: 1.900 euro; 2nd year: 1.900 euro; 3rd year: 1.900 euro</p> <p><b>Teaching assistantship</b> (availability of funding in recognition of supporting teaching activities by the PhD student): there are various forms of financial 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.</p>