

# CIVIL AND ENVIRONMENTAL ENGINEERING

## AMMIN/DIATI - Innovative processing for industrial clay minerals purification

<b>Funded By</b>	Dipartimento DIATI Politecnico di TORINO [P.iva/CF:00518460019]
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<b>Context of the research activity</b>	<p>The objectives of this PhD thesis includes (not necessarily all):</p> <ul style="list-style-type: none"> <li>o Innovative tools for a better knowledge, characterization of industrial minerals, by means of innovative laboratory techniques as XRF, XRD, SEM-EDS, ICP, microRAMAN.</li> <li>o Improving and optimization of physical treatment processes using different methods as density separation techniques, floatation, electrostatic and magnetic separation.</li> <li>o Optimization of environmental friendly techniques for the second step of purification</li> </ul>
<b>Objectives</b>	<p>Industrial minerals (IM), used in industrial processes and technical applications, are defined by their chemical, petrographic, and mineralogical properties and their potential uses. They include materials for the ceramics industry (from bricks to porcelain), the glass industry, the cement industry, filler minerals for rubber, paper, and plastics, thermal, acoustic, and electrical insulation, wear-resistant and abrasive coatings, feed additives and soil conditioners, pigment production, and the food, pharmaceutical, and cosmetic industries.</p> <p>The growing demand in the job market and the special attention given by EU by means Critical Raw Material Act let to highlight the importance of IM such as graphite, magnesium, and boron, feldspar, phosphorous and phosphate rock , but also clay minerals as kaolin and montmorillonite: important raw material for different industrial sectors. In particular the industrial clay minerals market is competitive, with the top five players holding 34–44% of the market, and this growth is primarily driven by increasing demand from end-use industries such as paper, ceramics, sanitaryware, fiberglass, paints and coatings, rubber, and plastics. High purity clay minerals are becoming scarce and for this reason the processes to remove the contaminant as titanium, iron and heavy metals need to be improved. At the moment the efficiency of purification method can reach the 90% depending on type of ore, method, and process used . Moreover the instability induced by wars makes it necessary for Europe and specifically for Italy, to obtain industrial minerals</p>

from sites that provide low-quality material. To improve the physical enrichment is necessary to test and improve the physical process method. In the last phase of chemical purification the most common chemical treatment as leaching should be replaced by a green and environmental-friendly methods.

**Skills and  
competencies  
for the  
development of  
the activity**

Candidates should have a solid environmental science background and strong motivation to learn through advanced research with a multidisciplinary approach.  
Expertise in environmental engineering, geology, laboratory analysis as XRF, XRD and SEM-EDS, Raman, raw materials processing are required.