Intervento realizzato da

In consideration of the determination of the Regione Piemonte – Direzione Istruzione, formazione e lavoro No. 218 of 2022, May 3 and s.m.i. which listed the higher institutions authorized to activate PhD positions in the apprenticeship format for the years 2022-2024 in the framework of a specific regional call for proposals (Apprendistato di Alta Formazione e Ricerca - Avviso Pubblico 2022-2026 per l'individuazione e la gestione dell'offerta formativa pubblica approvato con Determinazione 114 del 3/3/2022, modificato con D.D. n. 451 del 17/08/2022 e prorogato con D.D. n. 807 del 24/12/2024)

MATERIALS SCIENCE AND TECHNOLOGY

Characterization of carbon materials for greentech

Company	LAMICOLOR S.P.A. [P.iva/CF:00182100040]
Supervisor	LAMBERTI ANDREA - andrea.lamberti@polito.it
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Context of the research activity	Physico – chemical characterizations of carbon materials and their applications in green technologies. The company Lamicolor has planned for the winner of this position a collaboration within a contract of high apprenticeship according to the Italian Legislative Decree 81/2015, art. 45.
	Nowadays there is a growing interest about strategical change in industrial processes. The actual attempt is to change the life expectancy of the processed raw material. That in order to change the processes from today's linear economy to circular economy. One of the possible ways to increase the raw materials values is better managing industrial post processing organic residues by applying thermal degradation. These kinds of processes, such as pyrolysis, can be used to produce a synthetical gas called Syngas. That type of gas can become a primary-secondary matter in case of its recycling in thermal power plants through combustion. To further improve the pyrolysis process, carbon waste material developed as residue of reaction can be possibly processed in the way to make high value secondary material for different applications. The research field regards the exploration of different ways to recycle carbon residues from high pressure laminates waste material (HPL) pyrolysis process. To do that, physico-chemical characterizations of carbon materials will be done. It will be necessary to explore superficial properties modifications by using different physico-chemical synthesis techniques to modulate their properties. That in the way

	to explore their available and fitting properties for different applications products such as in electro-chemical storage devices or even in filtration devices.
Objectives	The first goal for the PhD candidate is to gain competences in pyrolysis working principle by experimenting the instrumentations sited in Lamicolor S.p.a. (Lamicolor). After that it will be required to setup different experiments to better improve the energy efficiency of the plant sited in Lamicolor. It will be then required to find the best setting of the gas cleaning system such as flow rate of the cooling system and improve the filtration system efficiency, modulating the parameters of the plant. Second, the candidate will focus his research activity to find the best chemical activation processes to further improve the superficial properties regarding superficial area and the affinity depending on the hypothetical end user. The pysico-chemical modification process should fit the best trade off between energy costs and the obtained superficial area properties, keeping special eye on the eventual scaling up of the process. Then the candidate will explore the post activation characteristics of the carbon material by BET, FTIR, RAMAN, and electrochemical analysis such as CV, EIS, GCD and cyclic retention by assembling electrochemical cells for supercapacitor or batteries applications. Thermal analysis can be required ante and post activation process. Based on the obtained results by the PhD candidate, further exploration of other possible applications for the activated carbon are going to be explored, such as for gas filtration application. Not necessary all the points must be ended in the research period.

Skills and competencies for the development of the activity	The candidate shall be less than 30 years old at the moment of the hiring from the company. The PhD candidate should preferably have an engineering education, spanning in chemical engineering, materials engineering or related field. In particular a basic knowledge in pyrolysis principle and previous experience in carbon materials electrochemical characterizations should be highly required. The candidate should be highly motivated, possessing problem-solving attitude and having ability to work with research group collegues. Previous experience in research, industrial environment is preferred.