



**The National University of Science and Technology
POLITEHNICA Bucharest**

HABILITATION THESIS

**Innovative Chemical Engineering Solutions: Bioprocessing for High-
Value Metabolites and Phytosynthesized Nanoparticles**

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ABSTRACT

The habilitation thesis entitled "**Innovative Chemical Engineering Solutions: Bioprocessing for High-Value Metabolites and Phytosynthesized Nanoparticles**" presents the main scientific results achieved after obtaining the doctoral degree, the evolution in the scientific career, and the main future development directions, being structured in two parts: Part I – includes the main scientific and professional achievements, while Part II presents the plan for the development of the professional career.

Chapter I.1 (Academic and Professional Activity) briefly presents the main milestones and professional achievements, while Chapter I.2 (Scientific Achievements) discusses, in the international context of advanced bioprocessing techniques and the innovative field of phytosynthesized nanoparticles. Structured in distinct yet interconnected chapters, the habilitation thesis begins with a reflection on my professional and academic path, followed by an in-depth analysis of the scientific achievements.

The first major section, "**Advancing Bioprocess Technologies: From Optimized Production to Strategic Utilization of High-Value Metabolites**," explores emerging strategies and technologies for optimizing bioprocessing conditions, enhancing the production of microbial metabolites. This includes advances in bioprocess modeling to improve predictive capabilities and process efficiency, along with innovative methods for the extraction and separation of bioprocessed metabolites. The strategic use of these metabolites in various industrial and therapeutic applications is also discussed, emphasizing the integration of new bioreactor technologies and real-time monitoring systems. Moving to "**Green Nanotechnology: Production of Nanoparticles through Phytosynthesis and Their Applications**," the thesis assesses the synthesis of metallic nanoparticles using plant extracts and their subsequent applications in agriculture and the food industry. This segment highlights the role of nanoparticles in promoting sustainable practices and enhancing food production systems.

The scientific activity carried out during the period 2009-2025 was disseminated through the publication of 113 articles indexed in the SCOPUS database, 5 patents/patent applications, 1407 citations (excluding self-citations, www.scopus.com) and a Hirsch index of 22 (excluding self-citations), SCOPUS ID: 23393553700. I have written three textbooks and two laboratory manuals, as well as numerous chapters in specialized books.

The second part of the habilitation thesis presents the professional development plan, highlighting the evolution in the scientific career, the main development directions, and the activities targeted in the coming period that will lead to increased visibility and impact of the scientific results.