論　文　の　要　旨

題　目: Synthesis of Porous Polysaccharide Particle and their Adsorption Properties
（ポーラス構造を持つ多糖類微粒子の合成と吸着特性）

氏　名　Nguyen Tri Tue

This dissertation presents a comprehensive study on the development of porous pectin particles for drug delivery applications, encompassing the synthesis method, characterization, and functional evaluation across three research papers. Pectin, a natural polymer, was utilized to fabricate meso-/macroporous particles through a template-assisted spray-drying method, followed by chemical etching. These particles showcased significantly higher surface areas and improved drug release rates compared to nonporous counterparts, demonstrating their potential as efficient drug delivery systems. This dissertation is divided into five chapters, the content of which is briefly described below.

Chapter 1 introduced the recent advancements and the motivation of developments in nanostructured particles, particularly those with porous structures. These particles, with their large surface area and high porosity, offer enhanced performance in various applications including catalysis, adsorption, and drug delivery. The synthesis of porous pectin particles using a template-assisted spray drying method represents a novel approach in this field, addressing the need for efficient and environmentally friendly drug delivery systems.

Chapter 2 focused on the preparation of porous pectin. Porous pectin particles were developed using poly(methyl methacrylate) (PMMA) or calcium carbonate ($CaCO_3$) as templates. It highlighted the control over pore size and surface area through the variation of template concentration, showcasing a significant increase in specific surface area compared to nonporous counterparts. This study highlights the potential of porous pectin particles in applications requiring high adsorption efficiency.

Building on the foundation laid by the previous chapter, **Chapter 3** focused on the protein adsorption capabilities of porous pectin particles. The particles exhibited rapid and high-capacity adsorption of lysozyme, a model protein, due to their macroporous structure and interconnected pore networks. The research underscores the importance of pore size and surface area in optimizing protein adsorption, positioning porous pectin particles as promising materials for biomedical applications.

Chapter 4 explored the use of porous pectin particles as a drug delivery system, with indomethacin as the model drug. The porous structure facilitated a faster drug release rate compared to nonporous particles, demonstrating the potential of porous pectin particles in targeted drug delivery, especially to the colon. The study provided insights into the mechanisms of drug release from porous particles and highlighted the versatility of pectin as a biomaterial for pharmaceutical applications.

Chapter 5 summarized the synthesis of porous pectin particles represents a significant advancement in the use of nanostructured particles for adsorption and drug delivery applications. Through innovative synthesis methods and the utilization of natural polymers, these studies contribute to the development of efficient, sustainable, and biocompatible materials. Future research could explore the application of porous pectin particles across a broader range of substances and conditions, further enhancing their applicability in various fields.