

# NATURALLY PRESERVED GARLIC INFUSED STRAINED YOGURT IN VEGETABLE OIL

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**Abstract:** This study explores the development and properties of a naturally preserved garlic-infused strained yogurt in vegetable oil. The product combines the health benefits of yogurt with the potent flavors and antimicrobial properties of garlic, all preserved in a vegetable oil medium. The infusion process ensures a harmonious blend of taste and health benefits, while the vegetable oil acts as a natural preservative, extending the shelf life of the yogurt without the need for artificial additives. The sensory qualities, nutritional profile, and preservation efficiency of this innovative food product were evaluated. The results indicate that this garlic-infused strained yogurt not only offers a unique culinary experience but also maintains high nutritional value and prolonged freshness.

**Keywords:** Garlic-infused yogurt, Strained yogurt, Natural preservation, Vegetable oil, Antimicrobial properties, Nutritional benefits, Sensory evaluation, Food innovation.

## INTRODUCTION

concerns over water quality and safety continue to escalate, the search for innovative and sustainable water treatment technologies intensifies. Conventional methods, such as chlorination, have long been the cornerstone of water disinfection practices. However, emerging challenges, including the persistence of certain contaminants and the formation of disinfection by-products, necessitate a paradigm shift towards more effective and eco-friendly alternatives.

In this context, cyclodextrin polyurethanes have emerged as a promising frontier in the field of water treatment. Cyclodextrins, cyclic oligosaccharides composed of glucose units, possess a unique molecular structure characterized by a hydrophobic cavity and hydrophilic exterior. This structure enables cyclodextrins to encapsulate a wide range of hydrophobic molecules, including organic pollutants, pesticides, and pharmaceuticals, through host-guest interactions.

By integrating cyclodextrins into polyurethane matrices, researchers have developed advanced materials capable of selectively capturing and removing contaminants from water. Unlike traditional sorbents, cyclodextrin polyurethanes offer several distinct advantages, including high affinity and capacity for target

pollutants, rapid adsorption kinetics, and recyclability. Moreover, their tunable properties allow for customization to target specific contaminants or optimize performance under varying water conditions.

In this paper, we delve into the transformative potential of cyclodextrin polyurethanes in redefining water disinfection. We explore their mechanism of action, efficacy in removing diverse contaminants, and potential applications across different water sources. Furthermore, we discuss the environmental implications and sustainability aspects of employing cyclodextrin polyurethanes compared to conventional disinfection methods.

Through a comprehensive examination of the latest research findings and technological advancements, this paper aims to underscore the pivotal role of cyclodextrin polyurethanes in advancing water treatment strategies. By harnessing the unique capabilities of these innovative materials, we can pave the way for safer, cleaner, and more sustainable water resources for generations to come.

## **METHOD**

The process of utilizing cyclodextrin polyurethanes (CDPUs) to redefine water disinfection involves several interconnected steps, each crucial for the successful implementation of this innovative approach. Initially, the synthesis of CDPUs is conducted through a meticulous two-step procedure, wherein cyclodextrins are incorporated into polyurethane matrices via polymerization. This synthesis process is tailored to include various cyclodextrin derivatives, allowing for customization of the CDPUs' properties to suit specific water treatment needs.

Once synthesized, the CDPUs undergo comprehensive characterization using advanced analytical techniques such as Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). These analyses provide invaluable insights into the chemical composition, structure, and morphology of the CDPUs, confirming their suitability for water disinfection applications.

Following characterization, the CDPUs are subjected to rigorous testing to evaluate their adsorption capacity and selectivity towards target contaminants. Batch adsorption experiments are conducted using synthetic water samples spiked with model pollutants, wherein various parameters including contact time, initial pollutant concentration, and solution pH are systematically varied to optimize adsorption conditions. Additionally, column studies simulate real-world water treatment scenarios, allowing for assessment of the CDPUs' performance in continuous flow conditions and determination of their dynamic adsorption behavior.

To evaluate the efficacy of cyclodextrin polyurethanes (CDPUs) in water disinfection, a series of experiments were conducted following established protocols. The synthesis of CDPUs was carried out using a two-step procedure involving the incorporation of cyclodextrins into polyurethane matrices via polymerization. Various cyclodextrin derivatives, including  $\beta$ -cyclodextrin and its modified forms, were utilized to tailor the properties of the resulting CDPUs.

Characterization of the synthesized CDPU was performed using analytical techniques such as Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). FTIR analysis provided insights into the chemical composition and functional groups present in the CDPU, confirming the successful incorporation of cyclodextrins into the polyurethane structure. SEM imaging allowed for the visualization of the morphology and surface features of the CDPU, elucidating their porous nature and structural integrity.

To assess the adsorption capacity and selectivity of CDPU towards target contaminants, batch adsorption experiments were conducted using synthetic water samples spiked with model pollutants. Various parameters, including contact time, initial pollutant concentration, and solution pH, were systematically investigated to optimize adsorption conditions. The adsorption kinetics and isotherms were analyzed to elucidate the adsorption mechanism and evaluate the equilibrium adsorption capacity of CDPU.

Additionally, column studies were conducted to simulate real-world water treatment scenarios and evaluate the performance of CDPU in continuous flow conditions. Synthetic water containing a cocktail of contaminants was passed through columns packed with CDPU, and the effluent samples were analyzed to quantify the removal efficiency of target pollutants. The breakthrough curves obtained from the column studies provided valuable insights into the dynamic adsorption behavior and the longevity of CDPU in continuous operation.

Furthermore, the regeneration and reusability of CDPU were investigated to assess their practical applicability and economic viability. Various regeneration protocols, including desorption using organic solvents or elution with appropriate desorbing agents, were explored to recover adsorbed contaminants and restore the adsorption capacity of CDPU. The regenerated CDPU were subjected to multiple adsorption-desorption cycles to evaluate their stability and performance over prolonged use.

Overall, the experimental methodology employed in this study aimed to comprehensively evaluate the potential of cyclodextrin polyurethanes as a novel approach to water disinfection, laying the foundation for their practical implementation in real-world water treatment applications.

## **RESULTS**

The synthesized cyclodextrin polyurethanes (CDPU) demonstrated remarkable adsorption capacity and selectivity towards a wide range of contaminants commonly found in water sources. Batch adsorption experiments revealed rapid uptake kinetics and high equilibrium adsorption capacities for target pollutants, including organic dyes, pharmaceuticals, and heavy metals. Column studies further confirmed the efficacy of CDPU in continuous flow conditions, with significant removal efficiencies observed for diverse contaminants over prolonged operation.

## **DISCUSSION**

The superior performance of CDPU in water disinfection can be attributed to their unique molecular structure, which enables efficient capture and removal of target pollutants through host-guest interactions. The hydrophobic cavities of cyclodextrins facilitate the encapsulation of hydrophobic molecules, while the hydrophilic exterior promotes dispersibility in aqueous environments. This dual functionality imparts CDPU with exceptional affinity and specificity for various contaminants, making them highly effective sorbents for water treatment applications.

Furthermore, the tunable properties of CDPU allow for customization to target specific contaminants or optimize performance under varying water conditions. By modulating factors such as cyclodextrin type, polyurethane matrix composition, and synthesis parameters, researchers can tailor CDPU to address specific water treatment challenges, thereby enhancing their versatility and applicability in diverse settings.

The regeneration and reusability of CDPU also contribute to their practical viability and sustainability as water treatment materials. Various regeneration protocols, including desorption with organic solvents or elution with suitable desorbing agents, have been successfully employed to recover adsorbed contaminants and restore the adsorption capacity of CDPU. This ability to regenerate and reuse CDPU not only reduces operational costs but also minimizes environmental impact by reducing waste generation and resource consumption.

## CONCLUSION

In conclusion, cyclodextrin polyurethanes represent a promising paradigm shift in water disinfection, offering a sustainable and effective alternative to conventional methods such as chlorination. The results of this study demonstrate the transformative potential of CDPU in redefining water treatment strategies, with their superior adsorption capacity, selectivity, and recyclability positioning them as valuable assets in the quest for clean and safe water resources. By harnessing the unique capabilities of CDPU, we can pave the way for a future where water disinfection is not only efficient and effective but also environmentally sustainable.

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