幾丁質及其衍生物在不同鹼性溶液中的物理化學性質

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三、Surface deacetylation of chitin nano-whiskers

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摘要

幾丁質是作爲自然界中最豐富的含氮天然多醣，具有多的分子間和分子內氫鍵，使其不溶於大多數水性溶劑，限制了其應用。而鹼性水溶劑是少數可用於食品、生醫領域的溶劑。去乙醯度和分子量是幾丁質類物質最重要的特性。因此，本文目的為觀察幾丁質及其衍生物(幾丁質、幾丁質奈米纖維(chitin nano-whiskers, CNW)、幾丁質水凝膠)在不同鹼性水溶液下的去乙醯度和分子量的變化，並探討其它可能的影響因子。結果顯示，鹼性水溶液(NaOH 及 KOH)可提高幾丁質及其衍生物的去乙醯度，當 KOH 加了尿素時，會有更大的影響。α-幾丁質和幾丁聚醣溶在 KOH/尿素時的最佳溶解溫度與去乙醯化的程度有關。去乙醯化 α-幾丁質(CT)組別在較低的溫度下就能實現快速膨潤和溶解，而幾丁聚醣(CS)組別則需要較高的溫度。K^+和 OH^-與 CT 及 CS 之間的強離子-偶極和氫鍵相互作用會影響它們在 KOH/尿素水溶液中的膨潤和溶解。而且，不同濃度的 NaOH 與不同的處理方法和衍生物也會影響到幾丁質的去乙醯度。在 CNW，隨著 NaOH 濃度從 10%增加到 30%和反應溫度的提高，CNW 的去乙醯度成功地從 4.4%提高到 55.2%。因此在幾丁質水凝膠，經過五次電漿處理，幾丁質水凝膠在 90%甲醇/水中懸浮並添加 12% NaOH 後，其去乙醯度可提高到 78.46%。此外，其重量平均分子量下降至 2.20×10^5，從然將其轉化爲幾丁聚醣。

The Deacetylation Degree of Chitin and Its Derivatives Under Different Alkaline Solutions

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Outline

1. Introduction
2. Rapid dissolution of chitin and chitosan with degree of deacetylation less than 80% in KOH/urea aqueous solution
3. Surface deacetylation of chitin nano-whiskers
4. Simultaneous deacetylation and degradation of chitin hydrogel by electrical discharge plasma using low sodium hydroxide concentrations
5. Conclusion

Abstract

Chitin is the most abundant nitrogen-containing natural polysaccharide in nature. It has many inter- and intramolecular hydrogen bonds, making it insoluble in most aqueous solvents, limiting its application. Alkaline water solvents are one of the few solvents that can be used in the food and biomedical fields. Acetylation and molecular weight are the most important properties of chitin. Therefore, the purpose is to observe the degree of deacetylation and molecular weight of chitin and its derivatives (chitin, chitin nano-whiskers (CNW), and chitin hydrogels) in different alkaline aqueous solutions. Alkaline aqueous solutions (NaOH and KOH) can increase the deacetylation degree of chitin and its derivatives, therefore when urea is added to KOH, it achieved higher deacetylation degree. The optimal dissolution temperature of α-chitin and chitosan in KOH/urea is related to the degree of deacetylation. Deacetylated α-chitin (CT) can achieve rapid swelling and dissolution at lower temperatures, while chitosan (CS) requires higher temperatures. The strong ion-dipole and hydrogen bonding interactions between K^+&OH^- and CT&CS affects their swelling and dissolution in KOH/urea aqueous solution. However, other than KOH aqueous solution, NaOH also has successfully affect the degree of deacetylation of chitin with different treatment methods and chitin derivatives. In CNW, as the NaOH concentration increased from 10% to 30% and the reaction temperature increased, the degree of deacetylation of CNW was successfully increased from 4.4% to 55.2%. Therefore, in chitin hydrogel, after five times plasma treatments, the chitin hydrogel suspended in 90% methanol/water by addition of 12% NaOH, and the degree of deacetylation increased to 78.46% and the molecular weight decreased to 2.20×10^5 and became chitosan.

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