MpoBi11-004

Unlocking new potential: Chitosan modification with diethyl ethoxymethylenemalonate.

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Chitosan, a natural biopolymer derived from chitin, has gained significant interest due to its inherent properties like biocompatibility, biodegradability, and non-toxicity. However, its applications can be limited by its low solubility and lack of specific functionalities. To address these limitations, researchers have explored various modification strategies, including one that involves diethyl ethoxymethylenemalonate (DEEM). This specific modification process involves grafting DEEM onto chitosan, introducing new functional groups and potentially enhancing its properties for various applications. This study explored the synthesis of ChDEEM, a modified chitosan, chitosan and diethyl ethoxymethylenemalonate (DEEM) were mixed varying reaction conditions (temperature, time, and ratio of starting materials) in DMSO. After the reaction, the product was purified to remove unreacted materials and then stored. The FTIR analysis showed a positive sign for the intended modification of chitosan with DEEM. The key peaks for the chitosan backbone (890 cm-1 and 1158 cm-1) haven't changed, indicating the core structure is intact. However, new peaks have emerged, providing evidence for the introduction of DEEM. The peak at 1251 cm-1 suggests the presence of the C-O bond from the reactant DEEM, while the peak at 1020 cm-1 confirms the formation of a new C-N bond, crucial for attaching DEEM onto chitosan. Additionally, the peak at 805 cm-1, although not directly signifying a new functional group, supports the presence of DEEM within the modified chitosan structure. Overall, the FTIR results strongly suggest successful chitosan modification with DEEM. A clear difference between chitosan and ChDEEM can be seen. Chitosan has sharp peaks, indicating a well-ordered crystalline structure (79%). After modification with DEEM, the peaks become broader and a larger, "fuzzy" region appears (Van der Waals halo or amorphous halo). This means DEEM disrupted the crystal structure, making ChDEEM less crystalline (38%). In simpler terms, chitosan went from being like a neatly organized stack of blocks to a more scattered mess after the modification. This study successfully synthesized a modified form of chitosan, named ChDEEM, using diethyl ethoxymethylenemalonate (DEEM). The analysis confirmed the successful attachment of DEEM molecules onto chitosan through the presence of new characteristic peaks in the FTIR spectrum. However, the modification process also resulted in a significant decrease in chitosan's crystallinity. Further investigations would be needed to understand the complete impact of this modification on ChDEEM's functionalities and potential applications.