The two aspects of cyclodextrin polymers: exploring soluble and insoluble worlds through synthetic routes, characterization and applications.

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Abstract

Cyclodextrins (CDs) are a family of cyclic oligosaccharides composed of glucopyranose units linked by α-1,4-glycosidic bonds. Derived from starch through enzymatic conversion, CDs are renewable and environmentally friendly materials. Their unique structure allows them to host guest molecules of appropriate size and polarity within their hydrophobic cavities, forming stable inclusion complexes. This property has led to widespread use in industries such as food, cosmetics, pharmaceuticals, and chemical manufacturing. Despite these advantages, native CDs present several limitations, including low inclusion stability, limited loading capacity, poor affinity for macromolecules, and an inability to encapsulate hydrophilic compounds. To overcome these challenges, various chemical modifications have been developed, most notably, the synthesis of cyclodextrin-based polymers, including linear, branched, and cross-linked structures [1-3].

This presentation will offer a comprehensive overview of the current state of cyclodextrin polymer research, discussing both their benefits and limitations. Special emphasis will be placed on recent advances aligned with green chemistry principles and future directions for sustainable development of these versatile materials.

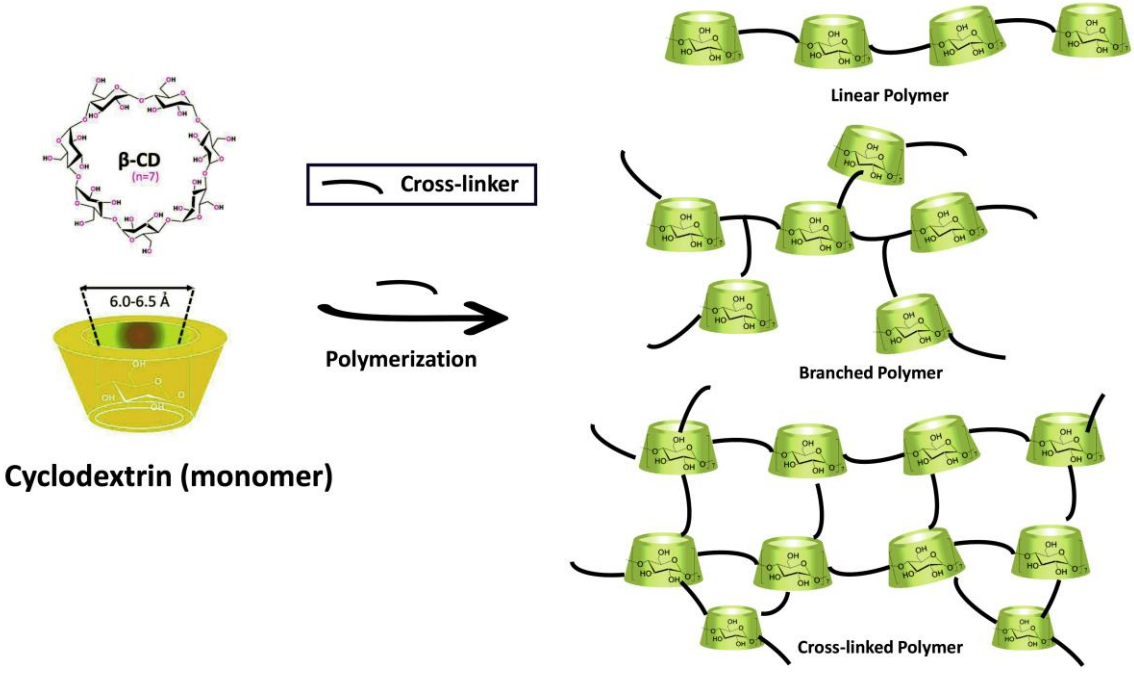

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Figure 1: Polymerization of cyclodextrin.

References

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[3] Trotta F., Caldera F., Cavalli R., Mele A., et al., Beilstein J Org Chem, 10:2586-2593 (2014).