chemistry proceedings

MDPI

Abstract

Functionalized B-Cyclodextrin for Smart Drug Delivery Application †

Elena-Ruxandra Radu [1,2,*], Cristina Stavarache [3], Andreea Madalina Pandele [3] and Stefan Ioan Voicu [2,3,*]

[1] National Institute for Research & Development in Chemistry and Petrochemistry—ICECHIM Bucharest, 202 Spl. Independentei, 060021 Bucharest, Romania
[2] Faculty of Applied Chemistry and Material Science, University Politehnica of Bucharest, Str. Gheorghe Polizu 1-7, 011061 Bucharest, Romania
[3] Advanced Polymers Materials Group, Faculty of Applied Chemistry and Material Science, University Politehnica of Bucharest, Str. Gheorghe Polizu 1-7, 011061 Bucharest, Romania; cristina.stavarache@upb.ro (C.S.); pandele.m.a@gmail.com (A.M.P.)
* Correspondence: radu.elena.ruxandra@gmail.com (E.-R.R.); stefan.voicu@upb.ro (S.I.V.)
† Presented at the 17th International Symposium "Priorities of Chemistry for a Sustainable Development" PRIOCHEM, Bucharest, Romania, 27–29 October 2021.

Keywords: β-cyclodextrin; drug delivery; cancer therapy

In recent years, an emphasis has been established on advanced cancer drug delivery, in order to improve the efficiency of the cancer therapy [1]. Cyclodextrin (CD) is a cyclic oligosaccharide formed by 6, 7, or 8 glucose units by α-1,4 glycosidic bonds, which are called α, β, γ-cyclodextrin, respectively [2]. Due to its hollow truncated morphology with a hydrophobic inside and hydrophilic outside, CD has been studied in numerous drug delivery systems [3–5]. In the present study, the modification of β-CD with 3-(Aminopropyl)triethoxysilane (APTES) was investigated. For this study we used: β-Cyclodextrin (β-CD) purchased from Fluka, 3-(Aminopropyl) triethoxysilane (APTES) from Sigma Aldrich, NaOH from Roth, dimethylforamide (DMF) from Acros Organics, and acetone from Chimreactiv. Firstly, NaOH, APTES, and DMF were solubilized by magnetic stirring for 1 h at 40 °C. After solubilization, β-CD was added and allowed to react for 2 h, at 40 °C, under magnetic stirring. The functionalized β-CD was precipitated in acetone, and in the end washed and filtered. The sample was dried at room temperature and investigated by NMR. The ^{1}H NMR was employed to further demonstrate the molecular structure of β-CD. The obtained NMR spectrum of β-CD shows the presence of characteristic proton peaks. The chemical structure of functionalized β-CD was studied, in order to look for possible biomedical applications, such as smart drug delivery systems.

Funding: This research was funded by Ministry of Research, Innovation and Digitization, CNCS UEFISCDI, grant number PN-III-P4-ID-PCE-2020-1154, Hemodialysis combined with stimuli-responsive drug delivery—a new generation of polymeric membranes for advanced biomedical applications, within PNCDI III.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

check for updates

Citation: Radu, E.-R.; Stavarache, C.; Pandele, A.M.; Voicu, S.I. Functionalized B-Cyclodextrin for Smart Drug Delivery Application. *Chem. Proc.* **2022**, *7*, 67. https://doi.org/10.3390/chemproc2022007067

Published: 21 April 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

1. Oprea, M.; Voicu, S.I. Recent advances in composites based on cellulose derivatives for biomedical applications. *Carbohydr. Polym.* **2020**, *247*, 116683. [CrossRef] [PubMed]
2. Zhang, D.; Lv, P.; Zhou, C.; Zhao, Y.; Liao, Y.; Yang, B. Cyclodextrin-based delivery systems for cancer treatment. *Mater. Sci. Eng. C* **2019**, *96*, 872–886. [CrossRef] [PubMed]
3. Tian, B.; Hua, S.; Liu, J. Cyclodextrin-based delivery systems for chemotherapeutic anticancer drugs: A review. *Carbohydr. Polym.* **2020**, *232*, 115805. [CrossRef] [PubMed]
4. Shelley, H.; Babu, R.J. Role of Cyclodextrins in Nanoparticle-Based Drug Delivery Systems. *J. Pharm. Sci.* **2018**, *107*, 1741–1753. [CrossRef] [PubMed]
5. Voicu, S.I.; Thakur, V.K. Aminopropyltriethoxysilane as a linker for cellulose-based functional materials: New horizons and future challenges. *Curr. Opin. Green Sustain. Chem.* **2021**, *30*, 100480. [CrossRef]