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Carbohydrate-based Ionic Hydrogels in Biocatalysis

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Introduction

Hydrogels are defined as hydrophilic 3D networks consisting of crosslinked polymers that can reversibly absorb large amounts of water while retaining their shape. The main focus of this work is the synthesis of novel glucose-based ionic hydrogels with different crosslinkers, their characterization and their application in biocatalysis.

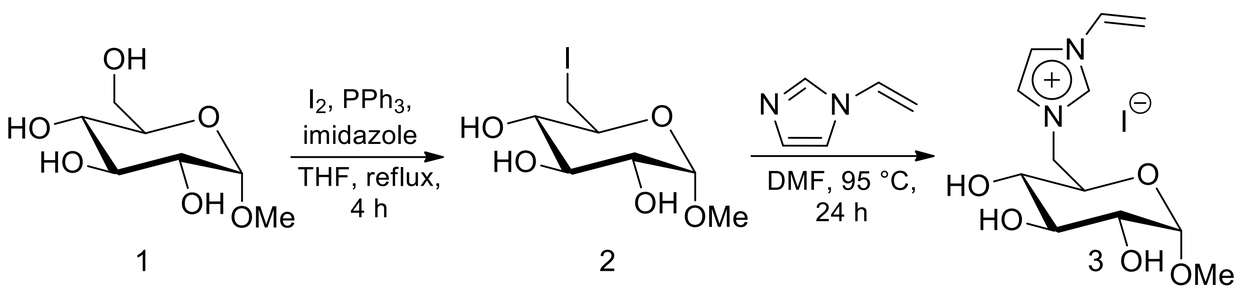


Figure 1: Three-step sythesis of GVIM-I.

Synthesis

To obtain the monomer for hydrogel synthesis, an iodine leaving group was first introduced at the 6-position of methyl-α-D-glucopyranoside (1, fig. 1). The iodinated compound (2) was then quaternized to glucosyl-vinyl-imidazolium iodide (GVIM-I, 3). Various crosslinkers (fig. 2) were used to prepare hydrogels. All hydrogels were synthesized by radical polymerization with ammonium peroxodisulfate (APS) and tetramethylethylenediamine (TEMED).

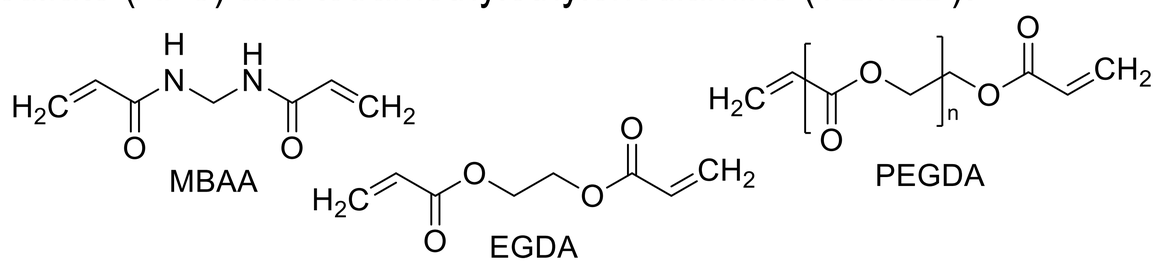
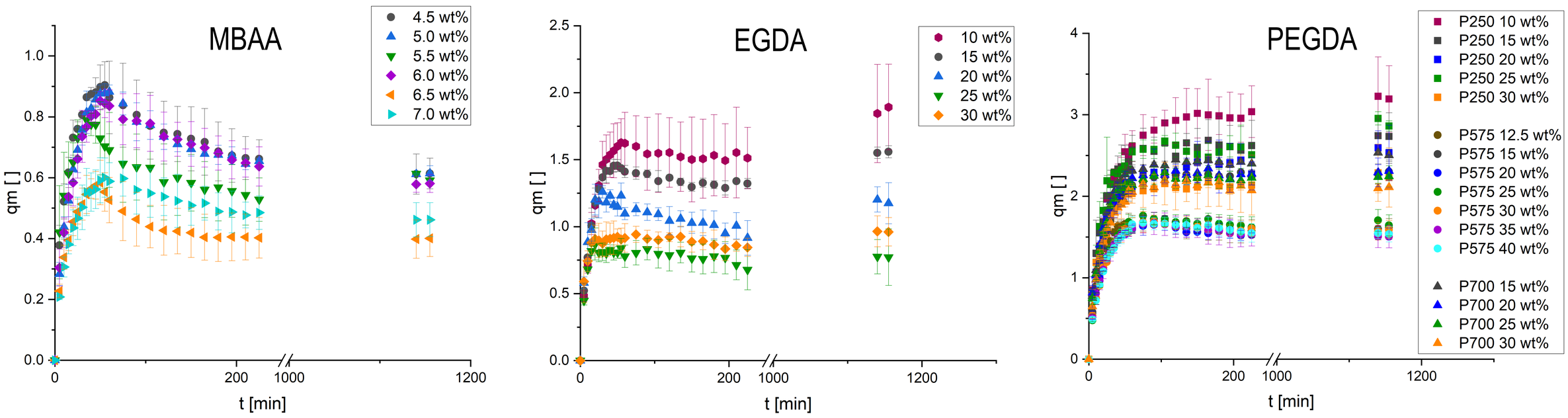


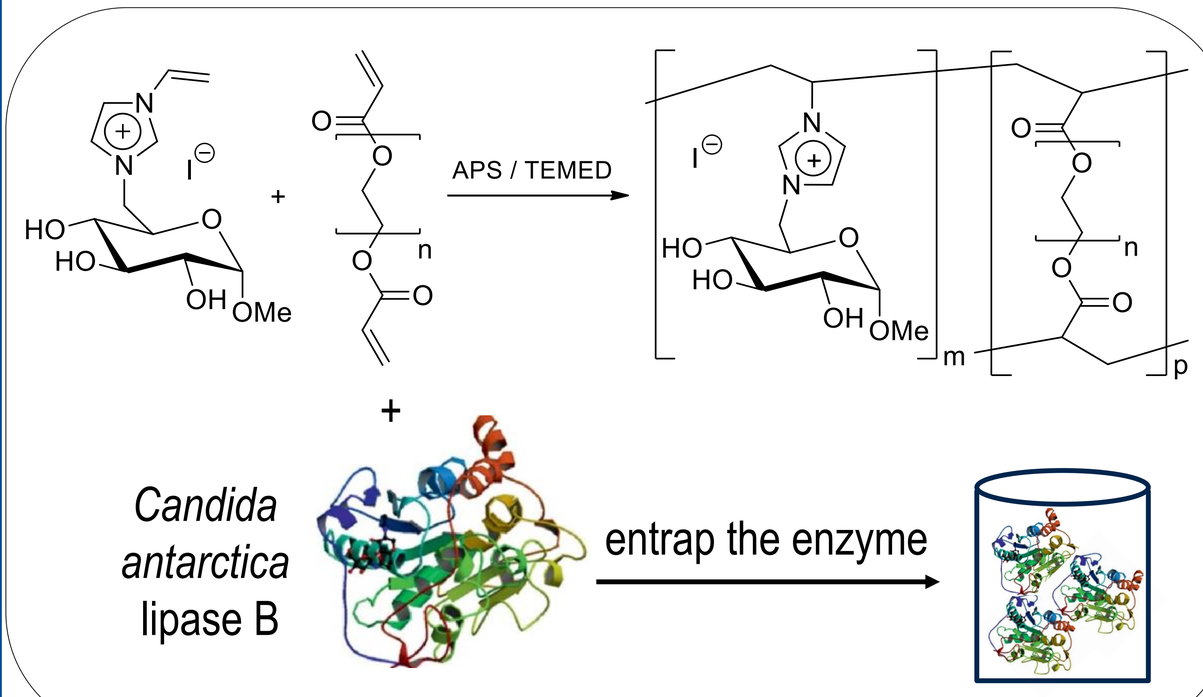
Figure 2: Crosslinkers used in this work. MBAA = Methylenebisacrylamide, PEGDA = Poly-(ethylene glycol) diacrylate, EGDA = Ethylene glycol diacrylate.

Swelling Behaviour

The degree of swelling of a hydrogel is an important parameter to characterize the behaviour in aqueous media. MBAA showed different swelling behaviour compared to EGDA and PEGDA.



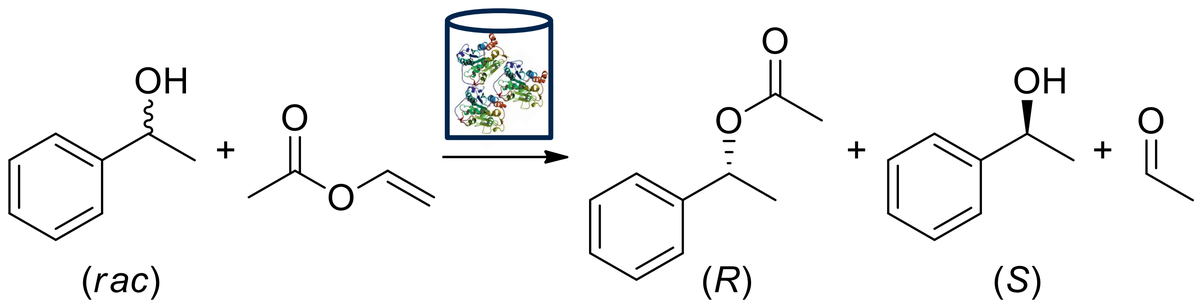
Immobilization



Biocatalysis

Test Reaction

As a test system for the immobilized CalB, it is planned to use the kinetic resolution reaction of *rac*-1-phenylethanol by transesterification with vinyl acetate.



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[2] S. Lambrecht, A. Villinger, S. Jopp, *IUCRdata*, **2022**, 7, x220265.

[3] A. Grollmisch, U. Kragl, J. Großeheilmann, *SynOpen* **2018**, 2, 192-199.

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