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# Swelling Behavior of Carbohydrate-based Ionic Hydrogels

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Hydrogels are defined as hydrophilic 3D crosslinked polymers that can, depending on their type of monomer and crosslinking degree, reversibly absorb water while retaining their shape. The main focus of this work is the synthesis of novel glucose-based ionic hydrogels with different types and weight percentages of crosslinker (CL) and the investigation of their degree of swelling (q) (see fig. 3).

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

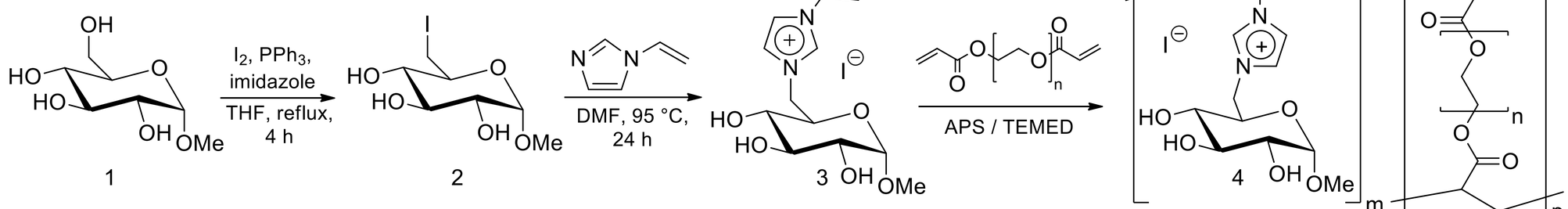



**Figure 1**: Three-step synthesis of glucose-based ionic hydrogels (4) with PEGDA as CL.

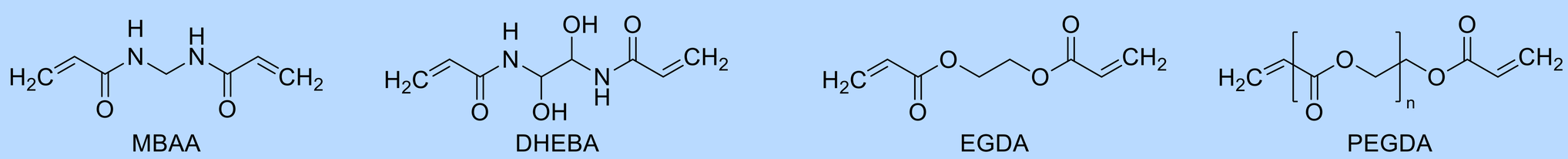
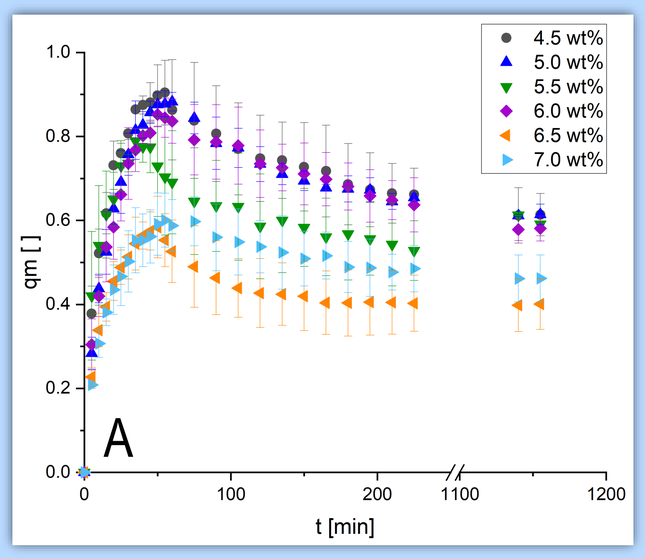
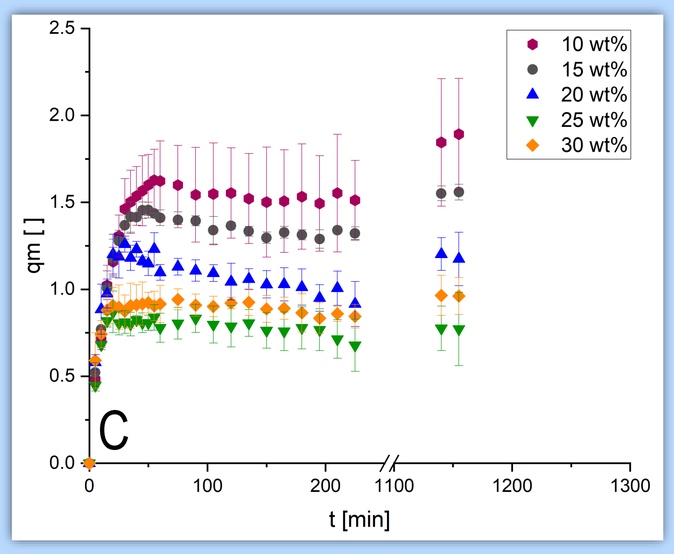


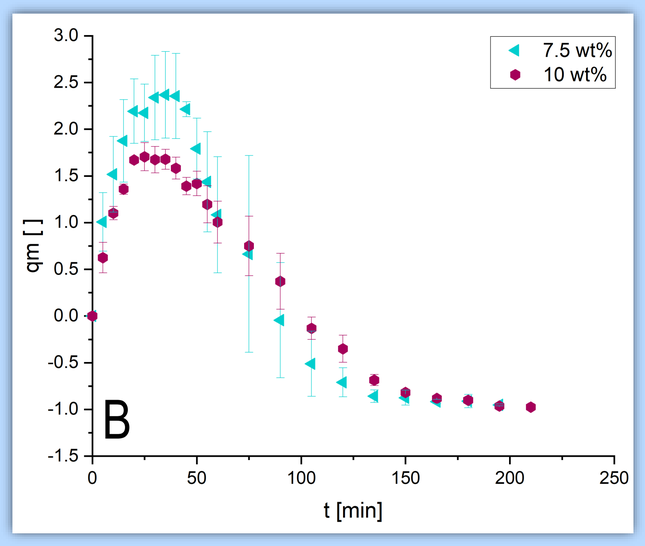

**Figure 2**: CL used in this work. MBAA = Methylenebisacrylamide, DHEBA = Dihydroxymethylene bisacrylamide, EGDA = Ethylene glycol diacrylate, PEGDA = poly(ethylene glycol) diacrylate.

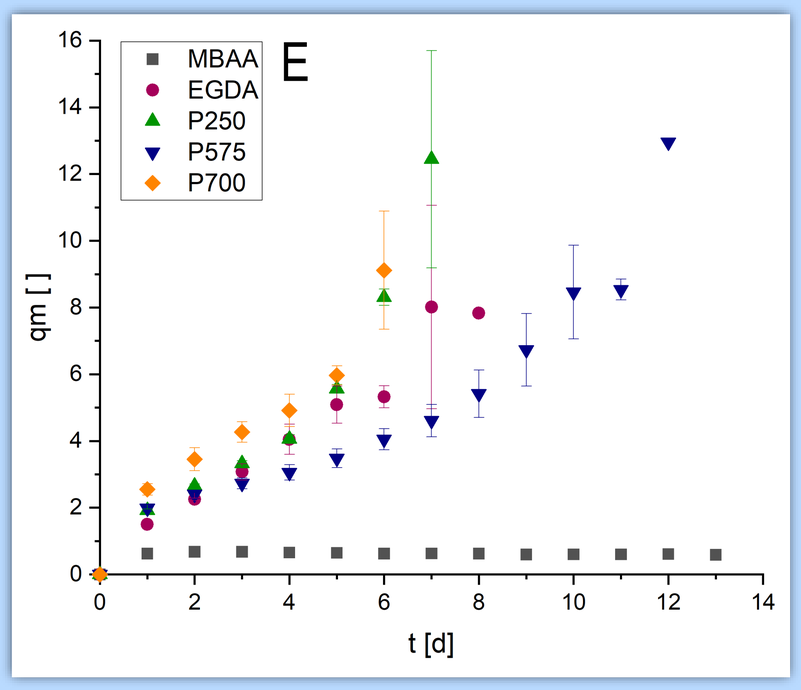
**Degree of swelling**

$$q = \frac{(w_t - w_0)}{w_0}$$



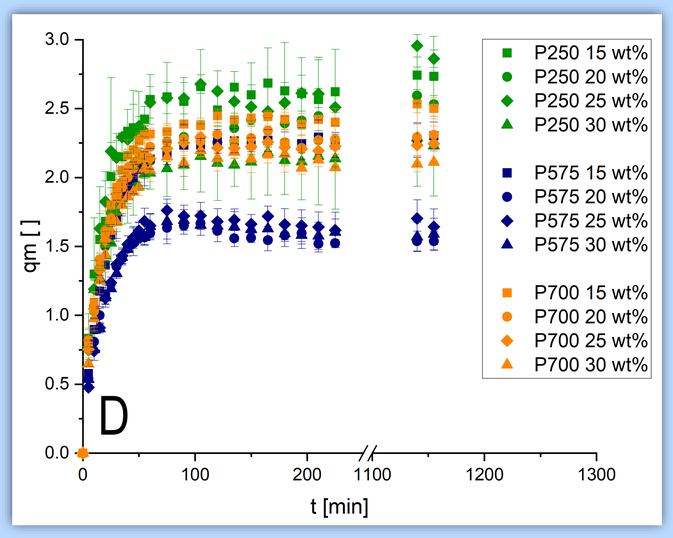




**Figure 3**: Swelling behavior of hydrogels with different types and amounts of CL. A = MBAA; B = DHEBA; C = EGDA; D = PEGDA 250, 575, 700; E = Long-term swelling behavior of different hydrogels with MBAA = 5 wt% and all diacrylates 15 wt% CL. All experiments are done in PBS (37 °C, pH = 7.4), n = 3.

## Summary

- ✓ Synthesis of novel glucose-based ionic hydrogels
- ✓ Different types and amounts of crosslinker were tested
- ✓ Characterization of their swelling behavior

## Outlook

- ❖ Investigate biocompatibility and antibacterial properties
- ❖ Application as drug delivery system or in biocatalysis

**References:**

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