# Batch cooling crystallization of xylitol produced by biotechnological route

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Xylitol is a five-carbon sugar alcohol used in the food and pharmaceutical industries because of its anti-cariogenic properties and its independence from insulin to enter the glycogenolysis pathways. This sugar is commercially obtained by a chemical process based on xylose reduction, which requires high temperature, pressure, and an expensive catalyst [1]. The biotechnological production of xylitol using yeast cells has been investigated as an alternative to the chemical process [2].

Hydrolysis or fermentation solutions are commonly used to recover xylitol in solid form. Crystallization allows obtaining pure polyol with solid consistency from relatively impure solutions in a single step. Since xylitol solubility increases at higher temperatures, cooling crystallization can be considered one of the potential crystallization methods. Thus, in this study, we investigated the effect of impurities on the cooling crystallization of xylitol from fermentation broth.

Saturated solutions were prepared by evaporation at 60 °C. A constant cooling rate of 0.083 K/min was used for 3 hours at a temperature range of 40 to 25 °C. Once the temperature reached 38.5 °C and the liquor became supersaturated, a dry powder of seed crystals was added. The mass of added seeds was 1% of the theoretical crystal mass, which was calculated from the theoretical solubility difference between 40 °C and 25 °C. The concentration of impurities in crystallizing liquid was 1.5-41 wt%.

Depending on the impurities concentration in the crystallization liquid crystal size distribution (CSD), the morphology and purity of obtained xylitol crystals varied.

According to the obtained results, xylitol CSD increased with increased impurity concentration up to 20 wt.% of impurities, but with a higher concentration of impurities, crystals formed agglomerates. In addition, the purity of crystals was analyzed by High-performance liquid chromatography, and the result is shown in Figure 1.

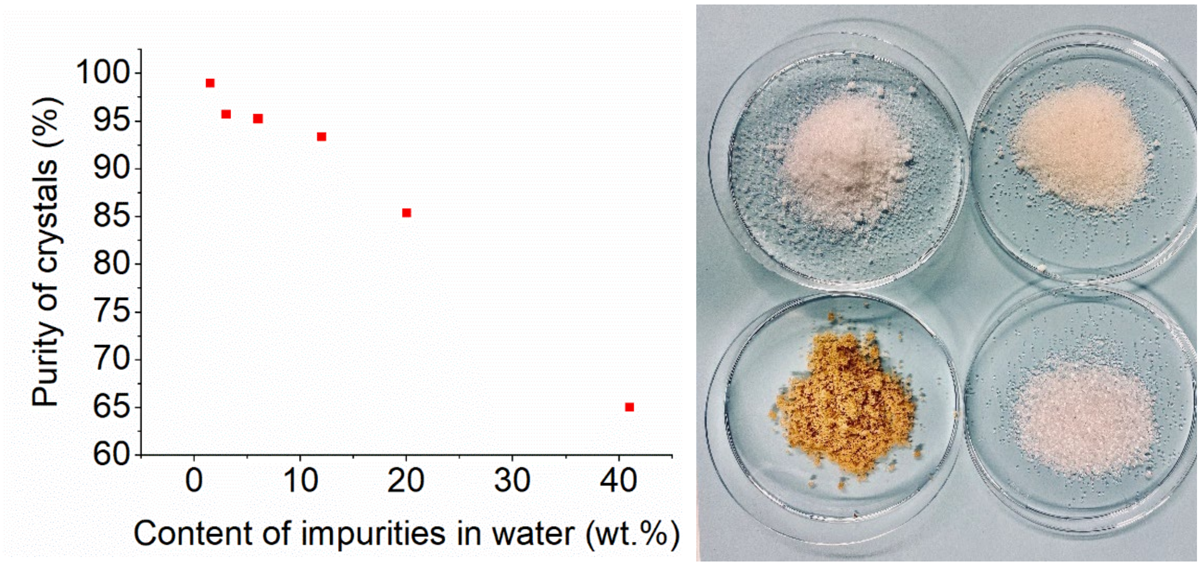


Figure 1. Purity of xylitol crystals obtained by batch cooling crystallization from water containing 0-40 wt.% of impurities

Reference list

[1] J. P. Mikkola, T. Salmi, R. Sjöholm, Stud. Surf. Sci. Catal. 1999, 122, 351–358. DOI: 10.1016/S0167-2991(99)80166-9.

[2] F. C. Sampaio, F. M. L. Passos, F. J. V. Passos, D. De Faveri, P. Perego, A. Converti, Chem. Eng. Process. Process Intensif. 2006, 45 (12), 1041–1046. DOI: 10.1016/j.cep.2006.03.012.

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