*“Investigation of multicomponent adsorption behaviour of aldehydes in malt-based beverages for selective removal of wort-flavour”*

**Abstract:**

A common sensory deficiency of alcohol-free beers is the over-perception of wort flavour, caused by Strecker aldehydes, which are not sufficiently reduced during the production process. Therefore, novel process designs are required to be able to fine-tune the flavour profile to the respective beverage matrix. Adsorption is identified to be a promising technology to facilitate the selective removal of wort flavour. The aim of this study is to select a suitable adsorbent and investigate the multicomponent adsorption behaviour in the alcohol-free beer. As the starting point, a total of 16 adsorbents of the categories of amine-functionalized polymers, hydrophobic resins and nano-filters, are screened in a complex hopped wort base in order to select for selectivity, capacity and reusability. Among the tested resins, the nano-filter CeoBead shows the most favourable properties with respect to selectivity and capacity due to their 2-dimensional separation characteristics (hydrophobicity and size exclusion). The hydrophobic resins Amberlite XAD4 and Sepabead SP850 also achieve high reduction in the aldehyde concentration, however, cause a significant change in colour. Amine-functionalized resins display mixed results, the main disadvantage being very slow kinetics and leaching of the functional groups to the medium. Subsequently, the three most promising resins, e.g. CeoBead, Amberlite XAD4 and Sepabead SP850 are selected and multicomponent isotherm data is obtained in an unhoped, non-alcoholic beer. The experiments reveal a linear isotherm behaviour of all aldehydes, and thus indicating non-competitive adsorption. Spiking experiments with competing beer constituents performed to test for robustness and detect the range of competitive adsorption depicted a significant reduction in adsorption efficiency by hop components for hydrophobic resins. CeoBead adsorption capacity was not affected by any of the tested scenarios. It is therefore concluded that CeoBead is the most potent adsorbent for wort flavour removal capable to achieve a significant improvement of the sensory properties of alcohol-free beer.