Application of Flotation for Enzyme Purification

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ABSTRACT

Up to now, attempts to purify enzymes via flotation are impeded by the unfolding and subsequent denaturing of enzymes. Our goal is to avoid this effect by attaching hydrophobic tags to the enzyme so the tags get in direct contact with air interface. Hence, a flotation cell was considered in which the air enters from the bottom via a porous medium and forms small bubbles. The bubbles carry the adsorbed enzymes to the froth zone where the entrained liquid drains down and the enzyme-rich foam overflows to the extraction beaker. We also performed an unsteady 1-dimensional modelling of the flotation process including surface coverage, liquid drainage and coarsening in the foam column. To that end, several mechanisms had to quantified and incorporated in the model.

To characterise the foamability, foam stability and coarsening rate of the foam, the dynamic foam analyser DFA100 was employed. By dynamic surface tension measurements of different enzyme solutions, we studied the behavior of enzymes at the air-water interface and obtained the adsorption isotherm of enzymes. Furthermore, flow-on-bubble experiments were conducted to emulate the rising of a bubble through the pulp and estimate the resulting surface coverage influenced by the convective transport.

The modeling results show good agreement with our experimental findings regarding foam recovery and enzyme concentration in the extract of our flotation cell. The modelling not only helps us to optimize the experimental parameters but also provides the basis for further upscaling of the process. The results indicated that the flotation technique can be implemented successfully for enzyme purification.

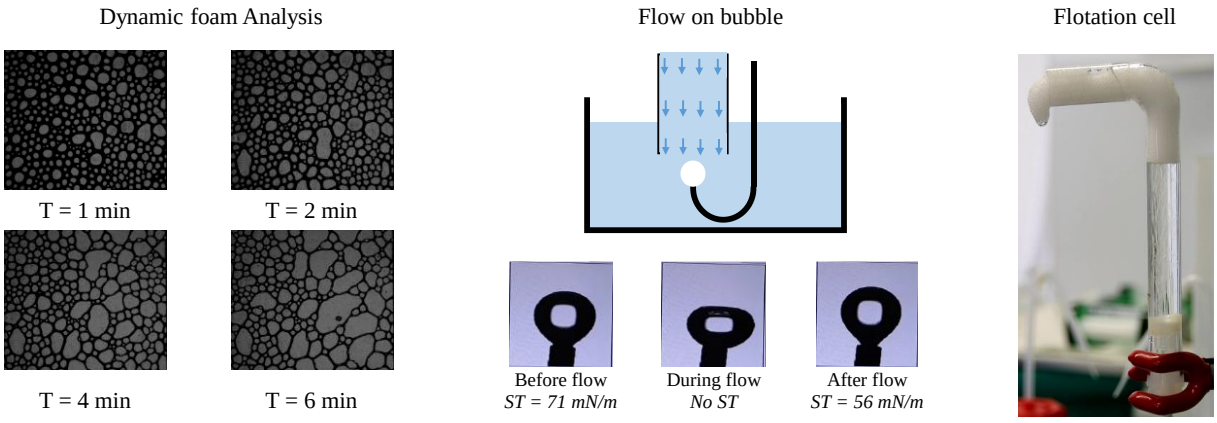

Figure 1- Experimental setup and procedures used in this work