

Glass columns as fixed bed reactors for immobilised enzymes

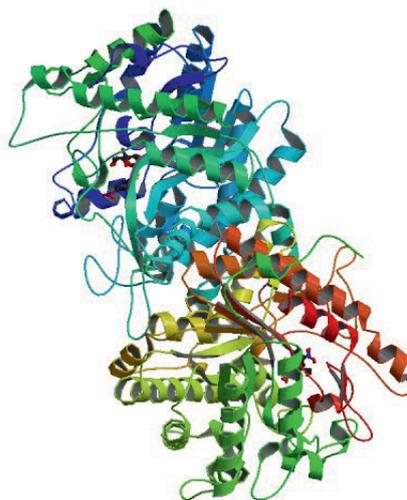


Fig. 1: Crystal structure of a Monocot beta-glucosidase.

In a recent study, YMC glass columns have been used as fixed bed reactors for immobilised enzymes.

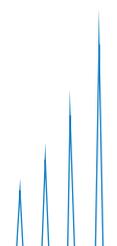
For immobilisation, a solid support (mesoporous silica, SBA-15) is used and the enzyme is linked to this surface via adsorption. This way, the high selectivity of enzymes can be used for industrial processes, as the stability is protected by the enzyme layer.

Immobilisation in fixed bed vs. batch

The scope of the study was the evaluation of the enzymatic activity of an immobilised β -glucosidase from almonds (130 kDa). J.M.Gómez et al. compared two immobilisation techniques:

1. Immobilisation in a fixed bed column
2. Immobilisation in batch.

The immobilisation in a fixed bed was carried out in an ECO^{PLUS} glass column with 5mm ID and 250mm length. As a solid support, SBA-15 was packed into the column. The enzyme solution was pumped through the column with a flow rate of 0.3 mL/min. The enzyme concentration and the catalytic activity at the column outlet were measured continuously.



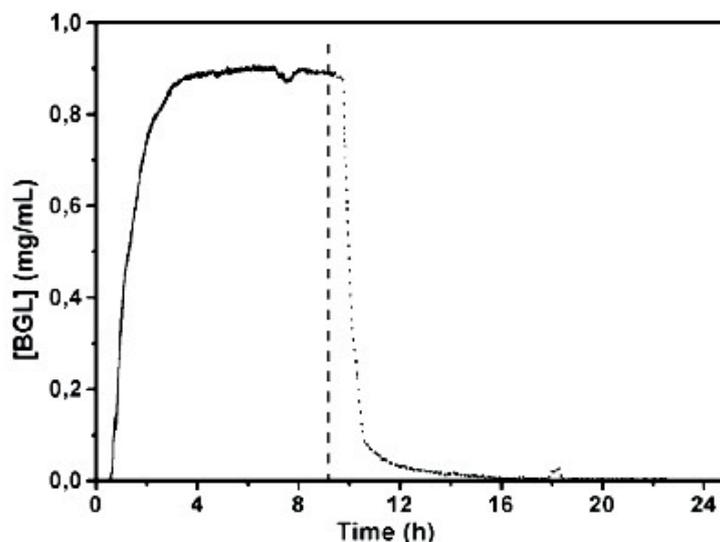


Fig. 2: β -glucosidase concentration during immobilisation (solid line) and washing (dotted line).

For the immobilisation in batch, the β -glucosidase was added to the SBA-15 suspension in Eppendorf tubes.

Excellent adsorption in a fixed bed glass column



Fig. 3: 5 mm ID ECO^{PLUS} glass column.

J.M. Gómez et. al. showed, that the immobilisation in a fixed bed glass column gives excellent results with regards to:

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| 1. Increased adsorption capacity: | 3.5 times greater adsorption compared to batch due to applied pressure |
| 2. Catalytic activity in continuous process: | 100 % substrate conversion |
| 3. High activity level: | Continuous process worked for more than 10h without deactivation of the enzyme |
| 4. Strong immobilisation: | Only 7 % of leaching in the washing step |

Literature:

J.M. Gómez et al., Immobilization of β -glucosidase in fixed bed reactor and evaluation of the enzymatic activity, *Bioprocess Biosyst Eng* (2012) 35: 1399-1405

