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Exploring alternative materials for the preparation of Enzybeads in HTE Screening

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PURPOSE OF THE ABSTRACT
Finding a suitable catalyst for a chemical transformation is key in developing more efficient and greener processes on larger scale. To increase data density while reducing required amounts of catalyst and starting materials, screening in a HTE environment gives significant advantages compared to traditional screening approaches. One way to enable automated dosing in Multititerplates (MTPs) of low amounts of catalyst is the adsorption of the catalyst on inert glass beads.[1] Since then, this technique has been successfully used for HTE screening in pharmaceutical industry.
To expand this technique to biocatalysts, an adapted procedure has been published under the name of Enzybeads.[2] However, all methods require the use of a Resodyn Acoustic Mixer (RAM) or manual milling of the crude lysate powders. Besides the cost of this device (ca. 60.000 $), the acoustic mixing process leads to heat generation in the samples, requiring a strict temperature control to avoid enzyme degradation.
We aimed to investigate alternative materials for Enzybeads to enhance high-throughput experimentation (HTE) screening of biocatalysts. The beads are prepared starting from enzyme liquid formulations, thus circumventing the use of the RAM and facilitating the process.

Different commercial resins as materials for Enzybeads were investigated and evaluated based on their ability to adsorb enzymes, retaining activity and stability under different conditions. The most promising materials were used to prepare Enzybeads of different enzyme classes, which were tested for their performance using model reactions. The beads can not only be used with automated dispensing machines but also using a custom-made manual parallel powder dosing apparatus, enabling a broader use of this technique for enzymatic screenings.

By developing this preparation method a significant decrease in material required for screenings will be possible and allow more frequent implementation of biocatalysis in chemical processes in pharmaceutical industry as well as in high-troughput screenings in enzyme discovery. As biocatalysts usually convey high selectivities by using mild conditions and aqueous media, the integration of more biocatalysts in chemical synthesis of APIs may improve the green chemistry metrics of future processes.

FIGURES

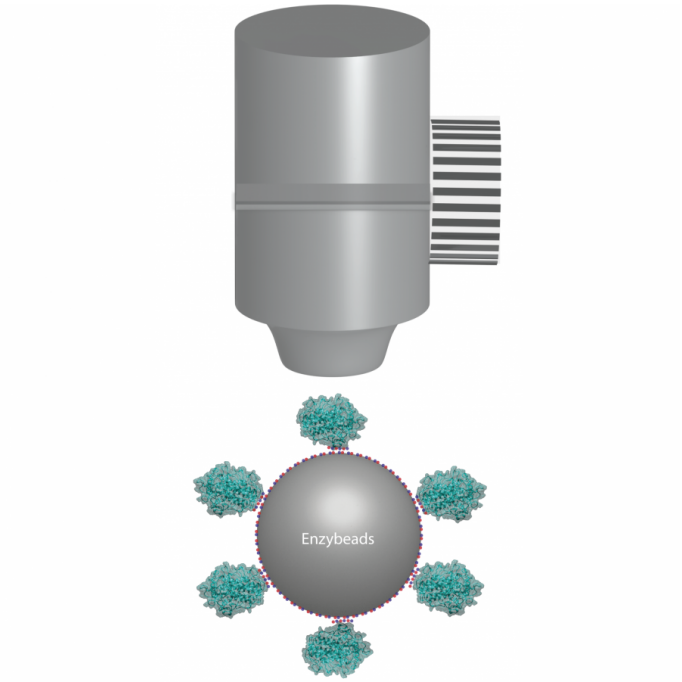

FIGURE 1
Enzybeads
Schematic representation of Enzybeads

FIGURE 2

KEYWORDS
HTE screening | biocatalysis | immobilization

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