BIOCATALYTIC TRANSAMINATIONS IN CONTINUOUS FLOW

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Transaminases catalyse asymmetric reductive aminations and are potentially useful for preparing chiral amines – industrially relevant drugs [1] currently produced by organometallic complexes in relatively polluting batch processes [2]. They are highly enantioselective and operate in mild conditions. The remaining challenge for a green and industrially practicable process is the design of solid transamination biocatalysts that can be easily used in continuous flow mode to increase productivity and atom efficiency [3].

ATA-117 transaminase was immobilized on highly porous silica monoliths, Si(HIPE) [4], by (i) simple adsorption, (ii) adsorption assisted by electrostatic interactions and (iii) covalent grafting. Depending on the strategy applied, silica surface was either used as such or functionalized with (3-aminopropyl)triethoxysilane (APTES). Materials were characterized by FT-IR, SEM, TGA and nitrogen physisorption. A model transamination reaction catalysed by ATA-117 allowed assessing biocatalysts efficiency in continuous flow mode.

Si(HIPE) monoliths (Figure 1) have been prepared and used as support for transaminases, and incorporated in a flow set-up. Porosity and specific surface area respectively reach 96 % and 800 $m^2.g^{-1}$. FT-IR and TGA analyses show an effective Si(HIPE) functionalization with APTES. Activity was systematically very stable with time on stream, indicating that enzyme leaching is negligible. While a low conversion was obtained for simple adsorbed enzymes (2.3 %), APTES functionalized samples led to much higher conversion. Covalent enzyme grafting was carried out successfully using APTES-functionalized supports with glutaraldehyde as coupling agent. Choosing a contact time of 10 min, conversion up to 12 % was obtained (adjustable). Immobilized transaminases remain fully enantioselective and showed good recyclability.

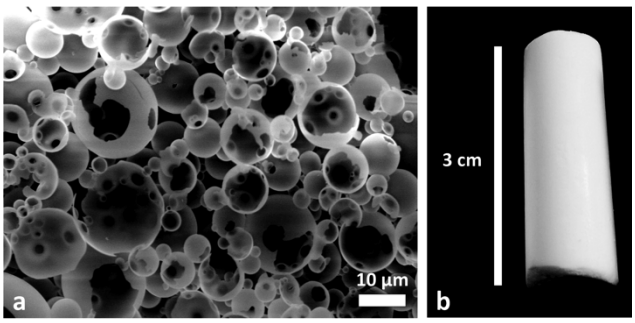

Figure 1 : Si(HIPE) monolith consists of empty interconnected spherical silica shells: SEM micrograph (**a**) and photograph (**b**).

Such heterogeneous biocatalysts exhibit all the required features for an enzymatic flow process and pave the way to the development of greener flow processes of high industrial interest.

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