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Flow Chemistry for the Enantioselective Synthesis of Chiral Cyanohydrins

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The demand for chiral cyanohydrins has been steadily increasing due to their broad applications in various industries, such as horticulture, cosmetics, pharmaceuticals, and, notably, the chemical industry. These compounds serve as valuable intermediates in the synthesis of *fine chemicals*, including α-hydroxy acids, aldehydes, ketones, and amines. Despite their importance, the chemical synthesis of chiral cyanohydrins often involves complex procedures, prompting the exploration of biocatalytic routes as a more sustainable alternative.

Flow chemistry has emerged as a powerful approach in chemical synthesis, providing precise control over reaction conditions and enhancing scalability compared to traditional batch processes. This continuous mode facilitates efficient heat and mass transfer, making it promising for reactions involving complex biocatalysts. The combination of flow chemistry with biocatalysis not only improves reaction efficiency but also reduces waste and energy consumption, aligning with *green chemistry* principles. In this context, the Henry reaction, involving the addition of a nitroalkane to a carbonyl compound, is particularly relevant for synthesising chiral cyanohydrins, producing valuable intermediates like β-nitroalcohols.

In this study, we investigated the covalent immobilisation of hydroxynitrile lyase from *Granulicella tundricola* (*Gt*HNL-3V) on organically modified monolithic microreactors (MHs) with amino (A) and octyl (O) groups. The activity, stability, and enantioselectivity of the heterogeneous biocatalysts were evaluated in the continuous synthesis of chiral cyanohydrins: *R*-mandelonitrile in an organic medium with buffer saturation and *R*-1-phenyl-2-nitroethanol in a biphasic system.

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