Using Twin-Screw Extrusion as a Route to Sustainable Manufacture

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There is a pressing need for new approaches to chemical manufacturing that are more sustainable than conventional solvent-based methods. Twin-Screw Extrusion (TSE), in which reagents are mixed and conveyed along a confined, temperature-controlled barrel by two intermeshing, rotating screws,[1] is emerging as a viable mechanochemical technique in which continuous, solvent-free synthesis, favourable to industrial implementation, can be achieved. Specifically, it has been shown capable of the continuous, $kghr^{-1}$ synthesis of cocrystals[2] and Metal Organic Frameworks (MOFs).[3] TSE has more recently been employed for the solvent-free synthesis of the Active Pharmaceutical Ingredient (API) nitrofurantoin,[4] with a cradle-to-gate Life Cycle Assessment (LCA) highlighting that TSE offers cost, sustainability, and operational advantages over the conventional, solvent-batch system.[5] Furthermore, the facile synthesis and subsequent co-amorphisation of Paracetamol, with citric acid, has been achieved under solvent-free conditions, highlighting the potential of TSE for improving drug bioavailability.

References:

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