Pushing the Limits: Evolving Twin-Screw Extrusion for Next-Gen Mechanochemical Processing

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Our previous work has established twin-screw extrusion (TSE) as an effective approach for scaling mechanochemical reactions into continuous, large-scale, solvent-free processes. Such has been the impact of this technology that it has seen commercial adoption for the synthesis of metal-organic frameworks,[1] with our work cited by IUPAC as one of the top ten emerging technologies set to transform the world.[2] Having expanded our research to encompass a diverse range of materials, including fine organic chemicals[3] and multi-layered graphene,[4] we are now focused on further improving the versatility of twin-screw extrusion. To this end, we are adapting the twin-screw extruder through the integration of complementary technologies, thereby enabling access to advanced chemical manufacturing and the synthesis of exotic compounds typically beyond the reach of conventional TSE methods.

[1] Crawford, D., Casaban, J., Haydon, R., Giri, N., McNally, T., James, S. L. (2015). *Chem. Sci.* **6**, 1645.

[2] Gollmón-Bel, F. (2019). *Chem. Int.*, **41**, 12.

[3] Crawford, D. E., Miskimmin, C. K. G., Albadarin, A. B., Walker, G., James, S. L. (2017). *Green. Chem.* **19**, 1507.

[4] Chen, H., Cao, Q., Ye, Z., Lai, B., Zhang, Y., Dong, H., Crawford, D. E., Istrate, O. M., James, S. L. (2024). *Adv. Mater. Technol.* **14**, 2301780.