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# Integrating design across the scales: 3D printable polymeric ionic liquids for applications in optoelectronics, catalysis and antimicrobials

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In recent years, there has been a significant transformation in the field of 3D printing, with a huge increase in applications beyond its initial niche uses like rapid prototyping and hobbyist projects.[1] This evolution has been marked by advancements in equipment, software, and, most notably, materials. Within this context, polymeric ionic liquids are solid materials incorporating ionic liquid moieties in their structure. Due to their tuneability, wide variety in molecular composition, and macromolecular architecture, they show a remarkable ability to stabilize molecular and nanostructured materials. The molecular and material programmable features of PILs combined with the geometric and device design flexibility of 3D printing open a vast array of opportunities for advanced solutions to global challenges. In this seminar, the development of specific PIL formulations for 3D printing and their applications in diverse fields, including antimicrobials,[2] catalysis,[3] and optoelectronics[4] will be presented and discussed.

1. a) Sara Miralles-Comins, *et al.*, *Polymers* **2022**, 14(23), 5121. b) W. Qian, *et al*. *Chem. Soc. Rev*. **2017**, 46, 1124.
2. a) Sara Miralles-Comins, *et al. Device*, **2024**, 2,100224. b) Dominic J Wales, *et al.*, *Biomater. Sci.*, **2021**, 9, 5397.
3. a) Diego Iglesias, *et al. Green Chem*., **2023**, 25, 9934. b) Marcileia Zanatta *et al. ACS Sustainable Chem. Eng*. **2023**, 11, 26, 9613. C) Dominic J Wales *et al. Green Chem.*, **2022**, 24, 3300.
4. a) I. Recalde, *et al. Adv. Funct. Mater*. **2023**, 33, 2210802. b) Sara Miralles-Comins, *et al. Nanoscale*, **2023**, 15, 4962. c) Dominic J. Wales, *et al. Advanced Materials*, **2018**, 30, 1800159.

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