

# Capture and valorisation of CO<sub>2</sub> with 3D printable ionic and polyionic liquids

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Additive manufacturing techniques, commonly known as 3D printing, offer an unprecedented level of freedom of design, which is having a profound academic and increasingly industrial impact.[1] The ability to rapidly develop and manufacture tailored designs with very complex geometries offers a huge range of possibilities, which have found applications in chemical synthesis, bioengineering and chemical engineering.[2]

Polycationic polymers with analogous structures to ionic liquids, known as poly(ionic liquids) (PILs) are very interesting smart materials due to the array of properties that can be generated by simple variation of anion-cation choice.[3] Ionic liquid properties can be effectively transferred from the bulk liquid to the supported phases.[4] Besides the unique and hugely tuneable properties of these smart materials, they are excellent matrices to stabilise advanced molecular and nanostructured materials.[3] Very recently, the possibility of 3D printing PILs has been demonstrated employing stereolithography [5a] and inkjet [5b].

In this way, the combination of: 1) tuneable PILs, 2) advanced molecular materials, ranging from enzymes and nanoparticles to redox active nanostructured molecules and 3) additive manufacturing offers virtually unlimited number of opportunities to effectively transfer molecular properties across the scales to develop macroscopic active devices, with tailored molecular, nano-, micro- and macrostructured functionalities.[6] A number of case studies will be presented to showcase the potential of these concepts in a broad range of fields, including antimicrobials and photochromic devices.

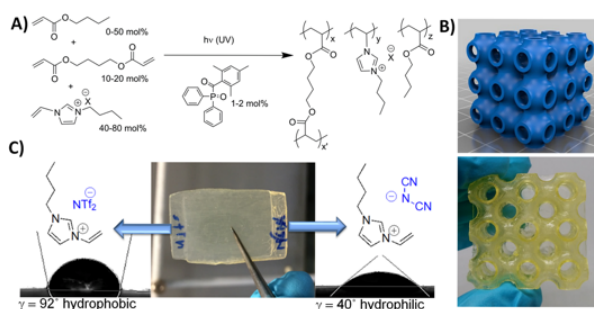


Figure 1 A) Base line formulations for 3D printing PILs. B) Example of a PIL-based 3D printed Schwarz P minimal surface. C) Multi-layer printing of hydrophilic and hydrophobic PILs in consecutive layers.[5a]

## Reference

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