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Hunaid Nulwala, Arsalan Mirjafari, Xu Zhou

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Ionic liquids and poly(ionic liquid)s for 3D printing – a focused mini-review

Hunaid Nulwala,^{a,b,*} Arsalan Mirjafari^{c,*} Xu Zhou^{b,*}

^aDepartment of Chemistry, Carnegie Mellon University, Pennsylvania 15213, United States.
Email: nulwala@liq-ion.com

^bLiquid Ion Solutions, LLC., Pittsburgh, Pennsylvania 15205, United States. Email: zhou@liq-ion.com

^cDepartment of Chemistry and Physics, Florida Gulf Coast University, Fort Myers, Florida 33965, United States. Email: amirjafari@fgcu.edu

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Abstract: Ionic liquids are a class of materials with unique physicochemical properties and intriguing preorganized and tunable solvent structures. Recent usage of ionic liquids as precursors, templates, and solvents has led to polymeric materials with tailored sizes, dimensionalities, morphologies, and functionalities that are difficult to achieve by employing common organic solvents. Ionic liquid monomers from unique macromolecules – known as poly(ionic liquid)s or polymerized ionic liquids – that incorporate cationic/anionic sites either pendant to or within the polymer backbones. Poly(ionic liquid)s has recently attracted increasing interest across a wide range of applications, e.g., thermo-responsive materials, carbon materials, catalysis, porous polymers, separation and absorption materials, and energy harvesting/generation as well as biological applications. This review presents a literature survey of recent work on three-dimensional (3D) printing technology over the past few years, highlighting the unique features of ionic liquids and poly(ionic liquid)s in emerging applications of 3D printing. We finally provide an outlook on several development opportunities that could lead to new advancements in this exciting research field.

1. Introduction

1.1. Ionic liquids and poly(ionic liquid)s – an overview

Applications for advanced macromolecular materials with precise engineered physicochemical properties and functionalities have been expanding dramatically to address the needs in resource management, improved energy efficiency, biomedical applications, and improving the overall environment. Demands in both academic and industrial research are increasing the necessity to construct polyelectrolytic systems with precise control over architecture, domain size, functionality, polarity, solubility, and reactivity.

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