MATERIALS SCIENCE AND TECHNOLOGY

PNRR - Innovative photocurable formulations for additive manufacturing applications

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	Design and development of photocurable formulation with enhanced and functional properties for additive manufacturing technologies based on the photopolymerization of liquid resins. PNRR M4C2, Investimento 1.3 - Avviso n. 341 del 15/03/2022 - PE0000004 3A-ITALY Made in Italy circolare e sostenibile - E13C22001900001
Objectives	The main aim of the present project is to find photocurable liquid formulations to produce objects with three-dimensional complexity and with enhanced thermo-mechanical and functional properties. Additive manufacturing technologies based on the photopolymerization of liquid resins (vat photopolymerization and material jetting technologies) will be considered. One of the main limitations of the actual technology is related to the presence of a maximum viscosity limit of the resins in use. This aspect represents a strong limitation for a much wider selection of photocurable resins and related formulations having a higher potential in terms of thermo-mechanical and functional properties. In the present project, the use of printing systems and related accessories able to operate at high temperatures for the realization of a lab-scale prototype system for resin application will be the base for exploring the possibility to use resins and related formulations having a viscosity too high for the current state-of-the-art. Resins with different chemical composition and reactivities will be evaluated as well as the possibility to incorporate inorganic fillers/particles for a further improvement of thermo-mechanical properties. The starting monomers and oligomers will be selected based on their rheological properties before curing, mechanical properties after cross-linking and their origin. When possible, monomers and oligomers obtainable from renewable resources will be considered for their impact on materials sustainability. Process parameters will be investigated and optimized.
Skills and	Master's degrees most appropriate for candidates are Chemical Engineering; Materials Engineering; Industrial Chemistry; Chemistry; Materials Science.

competencies for the development of the activity	Previous candidate work in the field of photopolymerization reactions and AM vat photopolymerization technology is a preferred competency for the selection process. Ability to work in a multidisciplinary team and prioritize one's work to meet deadlines.