DESIGNING NEW PHOTOINITIATORS FOR VOLUMETRIC 3D PRINTING

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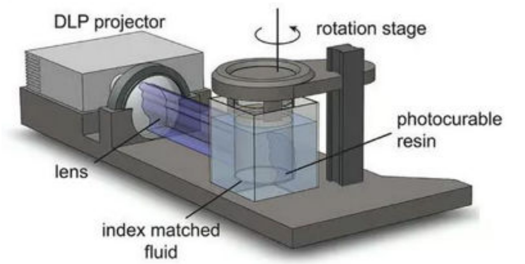

Fig. 1 : Basic principle of tomographic volumetric 3D printing. [1]

The project aims to develop new photoinitiating systems for volumetric 3D printing by bringing together the two partners LPIM and IS2M. Following the emergence of this new technology[1], the composition of photo-sensitive resins must be rethought, particularly with regard to the photonic properties (concentration of photoinitiators, etc.) and physico-chemical properties (viscosity, etc.). We wish to take advantage of the controlled radical photopolymerization (CRP) reaction, which have been highlighted very recently in the context of 3D printing by DLP (self-healing properties, more homogeneous mechanical properties, bulk and reconfigurable surface properties, etc.)[2-5]. Transposing CRP to volumetric 3D printing therefore represents a major challenge in the field and would make it possible to combine for the first time, the advantages of volumetric 3D printing (speed of printing) with those of the CRP.

Within this context, the objective of the PhD project will be i) to propose and explore new photoinitiating systems for the manufacturing of 3D objects by volumetric 3D printing, ii) to study the mechanical properties of these objects, iii) to investigate the photonic and physico-chemical parameters affecting the resolution of objects and finally iv) to demonstrate the living and self-repairing nature of printed objects. The student will have full access to a large experimental platform dedicated to the investigation of photopolymerization reactions and to the development and characterization of 3D objects (nanosecond transient absorption spectroscopy, fluorescence spectroscopy, Raman and FTIR microspectroscopy, Microscopy electronic scanning, photorheometer, volumetric 3D printer...).

This thesis subject will allow the student to acquire skills in both the fields of photochemistry and materials chemistry as well as to learn about a rapidly emerging process for 3D printing with high potential in industrial use.

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