

Popular science summary of the PhD thesis

PhD student	Bin Wang
Title of the PhD thesis	Polyspectral Tomographic Volumetric Printing
PhD school/Department	Department of Civil and Mechanical Engineering

Science summary

This thesis introduces a new concept known as Polyspectral Tomographic Volumetric Printing (PsTVP), poised to reshape the landscape of 3D printing by elevating both functionality and the quality of printed items.

The thesis begins with an investigation into a specific variant of PsTVP that empowers the crafting of objects featuring varying internal stiffness. The integration of orthogonal polymerization enables precise control of an object's stiffness across all three dimensions. The control is achieved through the manipulation of light of two different wavelengths, triggering separated chain reactions. The implications not only expand the horizons of 3D printing but also chart a path towards functional scaffold creation for tissue engineering.

The second part of the investigation focuses on improving fabrication quality. By extending the contrast in energy dosage during the printing process, the thesis presents evidence of substantial improvements in printing fidelity using a chemical agent. The research also ushers in the concept of a binary photoinhibitory system (BPS), uncovering its potential within the realm of PsTVP. This innovation promises better control over the polymerization process, translating into heightened precision, expedited printing rates, and broader process windows.

Overall, this PhD thesis advocates a paradigm shift in 3D printing technology. By introducing PsTVP, the research expands the boundaries of what can be achieved in terms of functionality and precision. From controlling material stiffness to enhancing printing accuracy, the findings have far-reaching implications across industries. The innovation in polyspectral tomographic volumetric printing, along with the breakthroughs in enhancing printing quality, set the stage for rapid and accurate 3D printing processes. This has the potential to reshape manufacturing, design, and various sectors that rely on intricate and reliable 3D printed objects. As we stand on the cusp of this transformative technology, the prospective applications and possibilities are boundless.