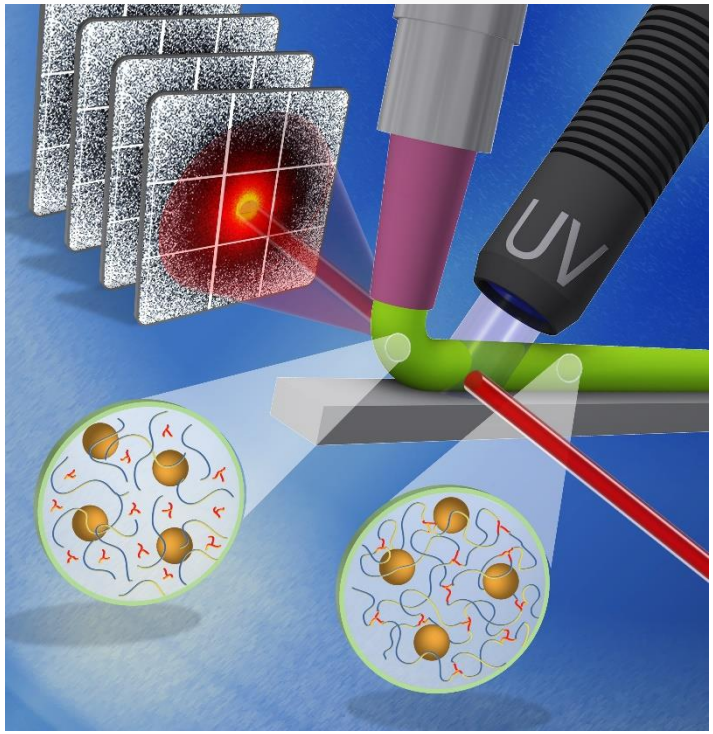
Unraveling 3D Printing Dynamics



The schematic shows the experimental setup to study the microscopic dynamics of the resin during 3D printing and simultaneous UV curing. Image credit: S. Coburn

Scientific Achievement

Scientists reveal that higher UV intensity results in faster curing of the resin, while the resin is less sensitive to directional forces during printing.

Significance and Impact

3D printing is a promising technique to rapidly produce polymeric materials; this work gives new insights about the fundamental nanoscale dynamics during 3D printing for optimization of material and processing parameters.

Research Details

- Time- and spatially-resolved studies were performed on dual cure polymer−filler composites during industrially relevant operations (Henkel material system).
- The investigation used *in situ* coherent X-ray scattering capabilities at the CHX beamline at NSLS-II during 3D printing, UV curing, and thermal solidification.
- Results showed correlations between microscopic dynamics and macroscopic material properties.
- Higher UV intensity resulted in more rapid curing of the resin and slower dynamics within added layers.

B. M. Yavitt, L. Wiegart, D. Salatto, Z. Huang, M. K. Endoh, S. Poeller, S. Petrash, T. Koga. *ACS Appl. Polym. Mater.* **2** (9), 4096-4108 (2020).

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