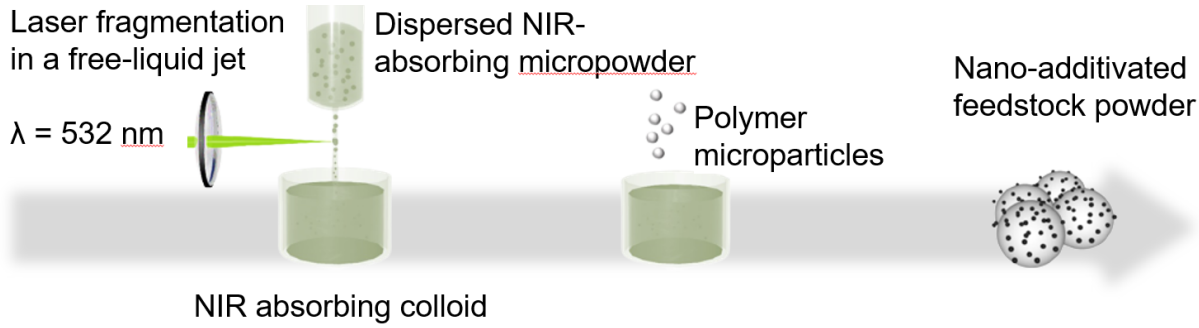
Modification of polymer powders for additive manufacturing by supporting of laser-generated IR-absorbing nanoparticles.

Contact person: Michael Willeke, Michael.willeke@uni-due.de

The versatility of Additive Manufacturing (AM) regarding the achievable object geometries is a promising topic of great interest. Processes like laser powder bed fusion (PBF-LB) allow the generation of a wide range of big and small-scale prototypes and the manufacturing of serial components. However, the diversity of laser systems employed in PBF-LB represents a challenge to the employment of some polymer powders due to the low absorbance of the laser light in the visible-NIR spectrum by the powder.

To address these problems, we propose the addition of near-infrared (around 800-1070 nm) absorbing nanoparticles (CuS, LaB_6) to the polymer powder. The effect is an increased optical absorbance in the spectral range of the NIR laser source. The nanoparticle size is adjusted by laser fragmentation in liquids; this enables a good nanoparticle distribution without agglomeration on the final powder.



In the context of the current topic, the synthesis of colloids by laser fragmentation in liquids (LFL) will be performed. We aim to produce a stable colloid with high absorbance in the NIR range through different conditions, e.g., by varying the solvent. The colloids' size, stability, and optical properties will be analyzed, followed by the support onto the polymer micro powder (PA12, TPU). The optical properties of the modified powder are also to be explored. Ultimately, the processability will be tested with a PBF-LB printer (SnowWhite^2).