Preliminary investigation on single isolated burning droplet using digital in-line holography

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Flame spray pyrolysis (FSP) is a versatile and promising technique for fast and scalable synthesizing nanoparticles [1,2]. Because of high phase purity, well crystallinity and well-control of size, the FSP-synthesized nanoparticles have been used for wide functional applications including sensors, catalysis, phosphors, electroceramics, batteries, and biomaterials. During FSP process, mass transfer of the precursor from liquid droplet to gas phase decides the product quality. Single droplet combustion has been a very valuable tool for providing fundamental knowledge of the FSP process.

Hereby we will present our preliminary results on single isolated burning droplet using digital in-line holography (DIH). DIH is a three-dimensional (3D) laser-based measurement technique, which can detect spatial- and time-resolved information of particle shape, velocity and position [3,4]. DIH has been employed to measure coal particles in flames [5], aluminum droplet combustion [6], and aerodynamic fragmentation of droplets [7]. Thus, we expect to use DIH to detect droplet 3D motion, droplet explosion, as well as the composition and temperature profiles from droplet surface to flame surface during the single droplet combustion of precursor-solvent solutions.

References

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