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# NANOSCALE CAVITATION STUDY IN A LAVAL NOZZLE BY SAXS

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Fluid transport can suffer from phenomena that are known in cavitation around propeller blades. The underlying nucleation phenomena, like heterogeneous nucleation due to surface roughness or impurities in the bulk phase, are known. Up to now only results of measurements on a later stage of bubble formation using fast video photography and synchrotron imaging have been published.

We used SAXS at the mySpot beamline (BESSY II) to investigate the onset of nanoscale fluc-tuations, developing sub-micron sized bubbles in a Laval nozzle, in which water is flowing at controlled pressure (up to 1 bar) and throughput. The Laval nozzle consists of a constriction of 5 mm in a slotted 3 mm thick metallic plate enclosed between two silicon plates, which transmit the 19 keV x-ray beam. The maximum velocity of water at the narrowest position amounts to 20 m/s. We used a closed-loop arrangement with a water reservoir, a pump and the Laval nozzle.

The scattering pattern is mapped in a spatial cross section through the nozzle. Different suspensions of SiO2 nanoparticles were used with particle sizes of 20 –30 nm as possible seeds for cavitation. The concentration of nanoparticles had a range between 107 and 109 per cm3. Scattering distribution across the nozzle cross section is mapped and correlated to mechanisms of heterogeneous nucleation (on nanoparticles and on walls) as well as on homogeneous nucleation, which is difficult to discern.

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