Phase critical angle refractometry for nanoscale bubble growth measurement

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Bubbles exist in a wide range of natural systems and industrial processes [1]. Accurate measurements of bubble size and its transient growth are of great importance, which is able to characterize the interaction between bubbles and surroundings. Nanoscale growth of a micron-sized bubble is difficult to measure since it is beyond the resolution of current bubble sizing techniques [2–4]. In this talk we will present a newly developed phase critical angle refractometry (PCAR) technique for simultaneous size and growth measurement. First, the principle of PCAR was theoretically derived, which reveals that the phase shift of time resolved fine structure of bubble light scattering linearly correlated with bubble growth. Then we verified PCAR through the simulation of bubbles with tiny size change, and the accuracy was analyzed. At last, experiments on a single bubble with tiny bubble growth show the feasibility of PCAR technique. PCAR is a promising tool for bubble study and can be extended to industrially-relevant applications.

References

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