Analyzing 3-phase Foams in Batch Flotation: a joint FWD-HIF Study

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Froth flotation, widely used in the processing and recycling of ores and raw materials, employs hydrophobic interactions between bubbles and particles to concentrate valuable materials in an overflowing froth phase. The flotation process, and therefore the quality of separation, is affected by the height of the 3-phase foam, called froth, and thus by the foamability. Within a joint European industry doctorate program between the Institute of Fluid Dynamics, HIF and TU Dresden, we have carried out a collaborative measurement campaign to collect data for modeling flotation subprocesses under varying hydrodynamic and reagent conditions using a laboratory scale flotation cell and a binary pyrite-quartz particle system. Froth phase measurements included the recording of the froth height through the transparent side wall of the flotation cell and imaging of the froth surface as well as foamability measurements of feed and tailing samples by means of dynamic foam analysis and measurement of the liquid fraction of the froth based on its electrical conductivity. Preliminary results show a significant change in froth properties during the flotation process from a particle-laden froth to finer bubbles containing fewer particles. Further data analysis is planned to investigate the influence of frother and collector concentrations as well as air flow rate and impeller tip speed on the foamability and froth height, impacting the recovery and grade of minerals. Such joint froth studies between the Institute of Fluid Dynamics and HIF belong to the sciences cases perspectively to be intensified by CeRI[2], one of the HZDR research infrastructure projects.

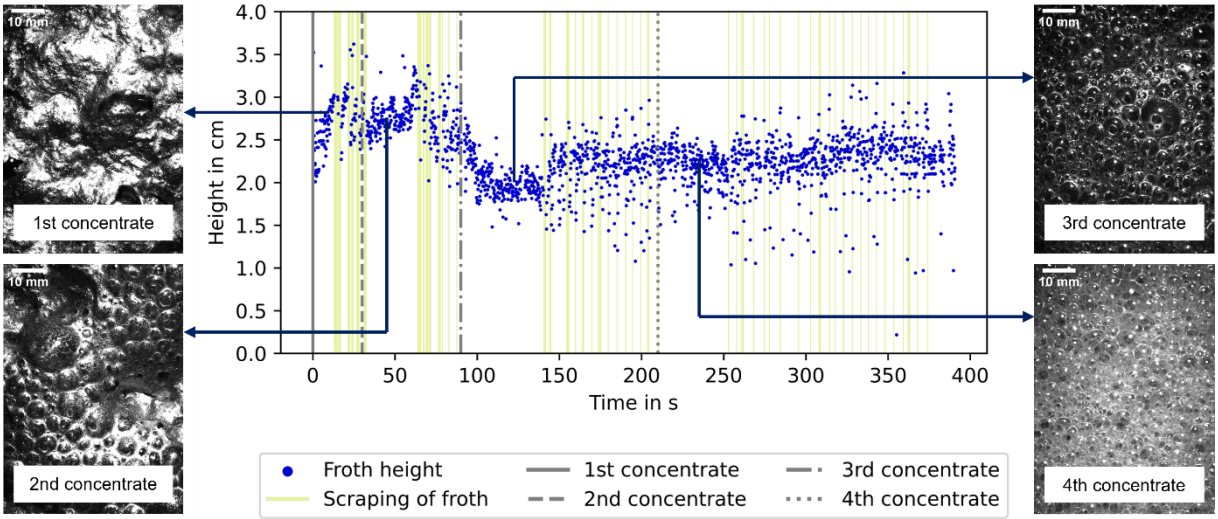

Fig. 1: Change in froth appearance and height during batch-flotation. The froth is scraped off and collected in defined time intervals, yielding four different concentrates.