The formation mechanism of surface gas/microbubbles under different hydrodynamic conditions with different degree of gas dissolution water

Ming Xu[1], Martin Rudolph[1]

1) *Helmholtz Institute Freiberg for Resource Technology (HIF), Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Chemnitzer Str. 40, 09599 Freiberg, Germany;*

In flotation process, the heterogeneous minerals surface supplies a lot of gas nucleate sites for surface gas/microbubbles formation. Surface gas/microbubbles play a key role to improve the attachment and detachment probability between bubbles and minerals. When a chalcopyrite plate was put in the normal static water, a lot of microbubbles formed after 140min because of gas molecules diffusion and nucleation on the heterogeneous and hydrophobic surface. Air dissolution in water has significant influences on the formation of surface gas/microbubbles. In the chalcopyrite micro-flotation experiments without collector and frother, three kinds of water with different gas dissolved degree (degassing water, normal water, and saturated water) were used to investigate the influences of gas dissolution. The flotation concentrate yield increased significantly with the increase degree of gas dissolution.

Hydrodynamic conditions have big influences on flotation process. High-turbulence flow can improve the collision probability between minerals particles and bubbles to promote flotation efficiency. Meanwhile, high-turbulence flow can also enhance the gas diffusion process to speed up the formation of surface gas/microbubbles to promote flotation efficiency. For this study, a laminar flow tube will be manufactured to investigate the nucleation process of surface gas/microbubbles under different hydrodynamic conditions with different degree of gas dissolution water. A micro-camera, an atomic force microscope (AFM), and other facilities are combined to observe the process of surface gas formation on chalcopyrite and graphite surface to discuss the formation mechanism of surface gas/nanobubbles.

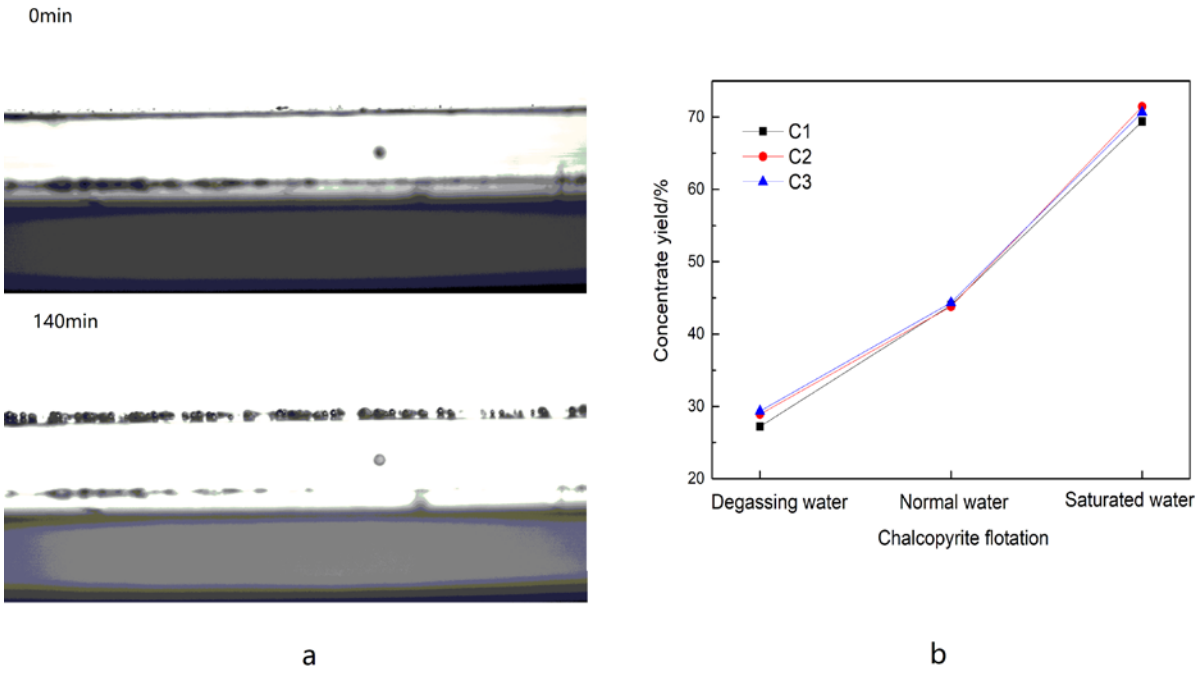

Fig1. (a) the formation of surface micro-bubbles on chalcopyrite surface in normal static water, (b) the chalcopyrite micro-flotation concentrate yield as a function of the gas dissolution degree.