Direct Observation of pH-Induced Coalescence of Latex-Stabilised Bubbles Using High-Speed Video Imaging

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Latex particles can be used to stabilise foams in the absence of any surfactant by adsorbing in close-packed particulate monolayers at the air-water interface.[1] Recently we have investigated the coalescence of pairs of air bubbles grown in a dilute aqueous solution containing a lightly cross-linked 380 nm diameter PEGMA-stabilised poly(2-vinylpyridine) latex using a high speed video camera.[2] The air bubbles were highly stable at pH 10 when coated with this latex as shown in Figure 1, although coalescence could be induced by increasing the bubble volume when in contact. Conversely, coalescence was rapid when the bubbles were equilibrated at pH 2, since the latex undergoes a latex-to-microgel transition and the swollen microgel particles are no longer adsorbed at the air-water interface. Rapid coalescence was also observed for latex coated bubbles equilibrated at pH 10 and then abruptly adjusted to pH 2, mirroring the rapid acid-induced catastrophic foam collapse previously reported.[3] Time-dependent post-rupture oscillations in the projected surface area of coalescing bubble pairs were studied. The latex-coated interface at pH 10 was found to be far more elastic than those coated with larger glass beads and was attributed to the compressibility of the latex monolayer on the bubble surface during coalescence.

Figure 1. Two highly stable 380 nm P2VP latex coated bubbles at pH 10 resisting coalescence.