Early-age acoustic emission measurements in hydrating cement paste: Evidence for cavitation during solidification due to self-desiccation

In this study, the acoustic emission activity of cement pastes was investigated during the first day of hydration. Deaired, fresh cement pastes were cast in sealed sample holders designed to minimize friction and restraint. The majority of acoustic emission events occurred in lower water to cement ratio pastes, while cement pastes with higher water to cement ratios showed significantly less acoustic activity. These acoustic events occurred around the time of setting. A layer of water on the surface of the cement pastes substantially reduced acoustic emission activity at the time of setting. According to these experimental results, the acoustic emission measured around setting time was attributed to cavitation events occurring in the pores of the cement paste due to self-desiccation. This paper shows how acoustic emission might be used to indicate the time when the fluid–solid transition occurs in a cement paste, often referred to as time-zero. Knowledge of time-zero is fundamental for determining when mechanical properties develop and in calculations of residual stresses.