

# **To Monitor Fracture Behaviors in Four-Point Cyclic Bending Tests of Low-Activated High Alumina Concrete and Standard Concrete RC Beams Using Acoustic Emission Technique**

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In this study, Acoustic Emission (AE) monitoring and analysis technique were introduced to evaluate the fracture behavior of reinforced concrete (RC) beam elements under the duration of cyclic loading test. Normal concrete (NC) and low-activated high alumina concrete (HAC) were selected to make the 200x30x20cm beam specimens for comparison. Serial tests including general four-point bending test and 0.5Hz cyclic four-point bending tests were conducted on the beams. The statics loading tests were to evaluate the beam property of both materials (NC/HAC) like yield and ultimate load, which would be used to plan the complicate procedure and range of cyclic loading tests. During the loading, acoustic emissions due to cracking, shearing, rubbing, de-bonding or interlocking could be monitored and recorded using a real-time high sampling rate DAQ system and proper sensors; besides, beam displacement, cracking situation and loading were also measured simultaneously. The AE results could chronicle the damages with related dynamic loading and displacement histories. The failure mode, yield load and ultimate load of each beam could be fairly examined. After analysis, the obtained long period AE density or accumulation value versus cyclic load-displacement records could reveal the fatigue extension and the related Kaiser effect. Both performances might indicate the loading damage belonging to crack development or plastic deformation, as well as the difference by materials. Through this study, quantitative observation on the fatigue and plastic performance of RC structure could be available through AE technique.