

# Experimental study on fracture properties of dam concrete under post-peak cyclic loading based on DIC and acoustic emission techniques

Jingwu Bu<sup>1</sup>, Huiying Xu<sup>1</sup>, Xinyu Wu<sup>1</sup>, Xudong Chen<sup>2</sup>, and Bo Xu<sup>1</sup>

<sup>1</sup>Yangzhou University

<sup>2</sup>Hohai University

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## Abstract

In order to study the fracture properties of dam concrete under post-peak cyclic loading, wedge splitting tests with three loading rates (0.001 mm/s, 0.01 mm/s, 0.1 mm/s) were performed on notched cubic dam concrete specimens. Meanwhile, the acoustic emission (AE) and digital image correlation (DIC) technologies were used to record the crack propagation process of specimens. Test results show that the fracture of dam concrete has a significant rate effect: with the loading rate increases, the peak load increases, the slope of the post-peak P-CMOD curve gradually decreases and the stiffness degradation of dam concrete becomes more serious. The cumulative AE count shows a step increasing trend and has a Kaiser effect. The Kaiser effect decreases with the post-peak cyclic loading procedure, and with the loading rate increases, the Kaiser effect increases. With the increasing of loading rate, AE energy fluctuates violently and  $b$  value fluctuates frequently, indicating the damage of dam concrete becomes more serious. As the loading procedure, the damage of the specimen accumulates gradually, and the strain recovery rate decreases gradually. With the loading rate increases, the strain recovery rate decreases and the permanent crack increases. Based on the fictitious crack model, the effective crack length shows a gradual and steady rising trend. As the loading rate increases, the growth rate of the effective crack length becomes large.

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