

## Study on Comparison Between Acoustic Emission Behavior and Strain on Concrete Surface During Rebar Corrosion in Reinforced Concrete

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**Abstract :** The development of techniques evaluating deterioration on concrete structures is vital for structural health monitoring (SHM). One of the main reasons for reinforced concrete structure's deterioration is the corroding of embedded rebars. It is a natural process that begins when the rebar starts to rust. It occurs when the protective layer on the rebar is destroyed. The rebar in concrete is usually protected against corrosion by the high pH of the surrounding cement paste. However, there are chemicals that can destroy the protective layer, making it susceptible to corrosion. It is very destructive for the lifespan and durability of the concrete structure. Corrosion products which are 3 to 6 times voluminous than the rebar stress its surrounding concrete and lead to fracture as cracks even peeling off the cover concrete over the rebar. As is clear that concrete shows limit elastic behavior in its stress strain property, so corrosion product stresses can be detected as strains from the concrete surface. It means that surface strains have a relation with the situation and amount of corrosion products and related concrete fractures inside reinforced concrete. In this paper, a comparative study of surface strains due to corrosion products detected by strain gauges and acoustic emission (AE) testing under periodic accelerated corrosion in the salty environment with 3% NaCl is reported. From the results, three different stages of strains were clearly observed based on the type and rate of strains in each corrosion situation and related fracture types. AE parameters which mostly are related to fracture and their shapes, describe the same phases. It is confirmed that there is a great agreement to the result of each other and describes three phases as generation and expansion of corrosion products and initiation and propagation of corrosion-induced cracks, and surface cracks. In addition, the strain on the concrete surface was rapidly increased before the cracks arrived at the surface of the concrete.

**Keywords :** acoustic emission, monitoring, rebar corrosion, reinforced concrete, strain

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