Measuring Strain Distribution along Rebar embedded in Concrete using Neutron Diffraction

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In modern society, architectural and civil engineering structures such as reinforced concrete buildings require high seismic performance to minimize the risk exposed from urban earthquake hazards. In reinforced concrete structures, the bond resistance between rebar and concrete is one important parameter for discussing the bond condition, and typically evaluated by measuring the strain distribution along the embedded rebar. In this study, we applied the time-of-flight neutron diffraction technique to the strain measurement of the rebar embedded in the reinforced concrete. The three-dimensional deformation behavior of the embedded rebar including the axial and lateral strains was accurately measured under loading (Fig. 1(a)) [1]. Furthermore, it was demonstrated that the strain distributions along rebar around cracks exposed in concrete can be measured by neutron diffraction (Fig. 1(b)). The neutron diffraction technique is expected to be a novel strain measurement method for the rebar embedded in concrete to understand actual phenomena on reinforced concrete structures.

References

[1] H. Suzuki et al., Meas. Sci. Technol., **25** (2014) 025602.

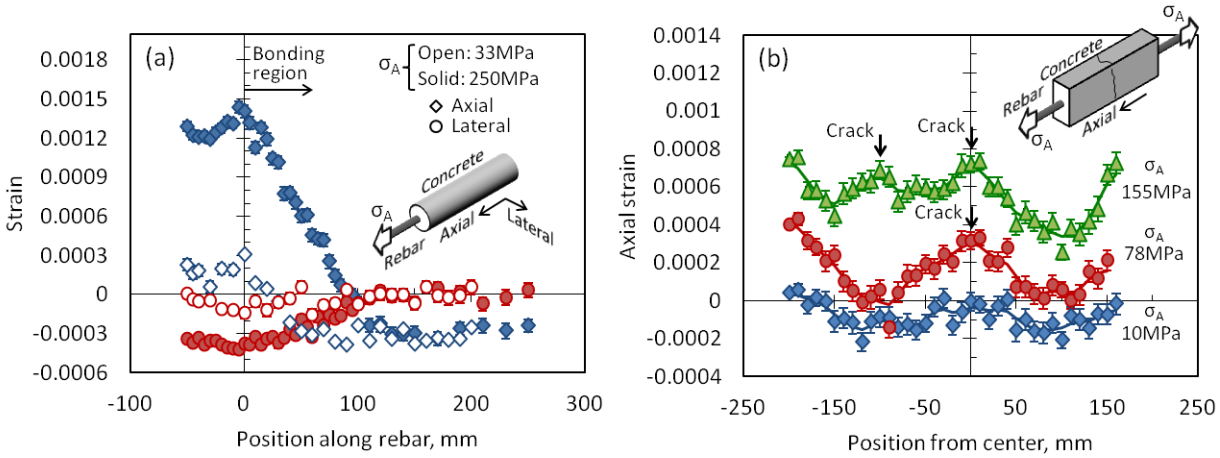

Fig. 1 Strain distributions along rebar (a) under pull-out loading [1] and (b) around cracks exposed in concrete under tensile loading.