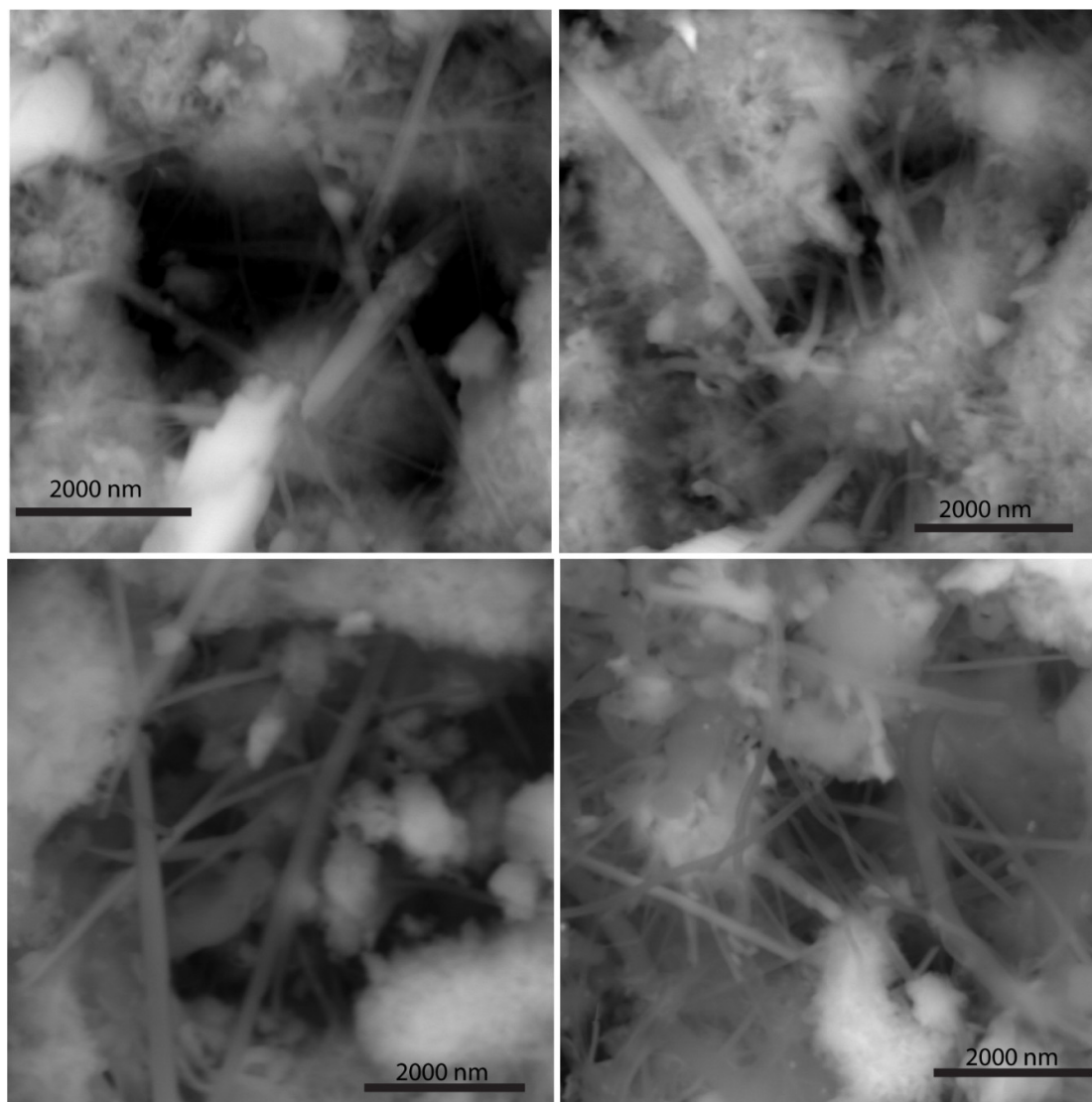# Supplementary Materials: Nanostructure and Fracture Behavior of Carbon NanoFiber-Reinforced Cement Using Nanoscale Depth-Sensing Methods

Ange-Therese Akono [1,2]

[1] Department of Civil and Environmental Engineering, Northwestern University, Evanston, 60208 IL, USA; ange-therese.akono@northwestern.edu
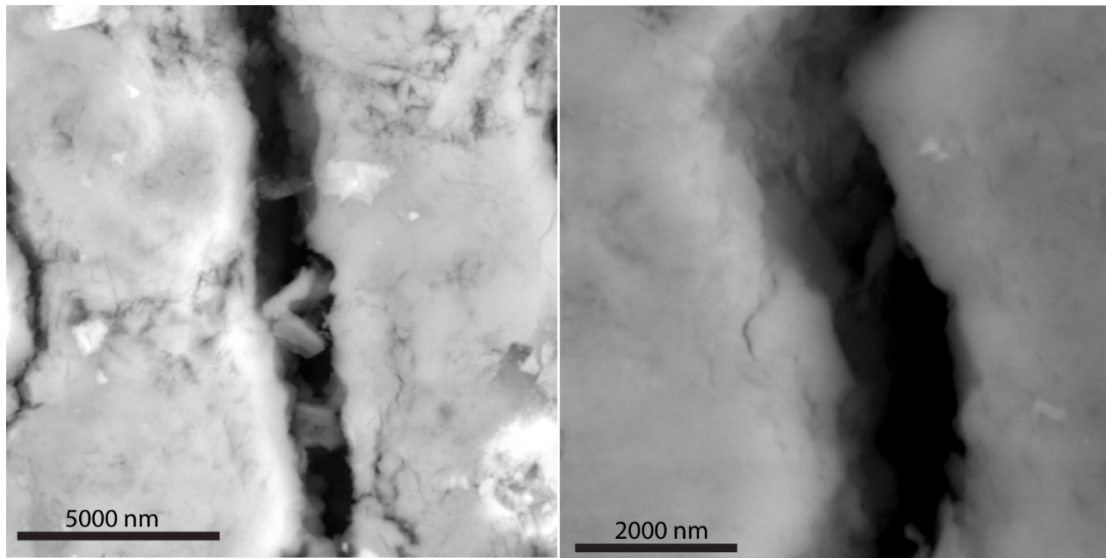
[2] Department of Mechanical Engineering, Northwestern University, Evanston, 60208 IL, USA

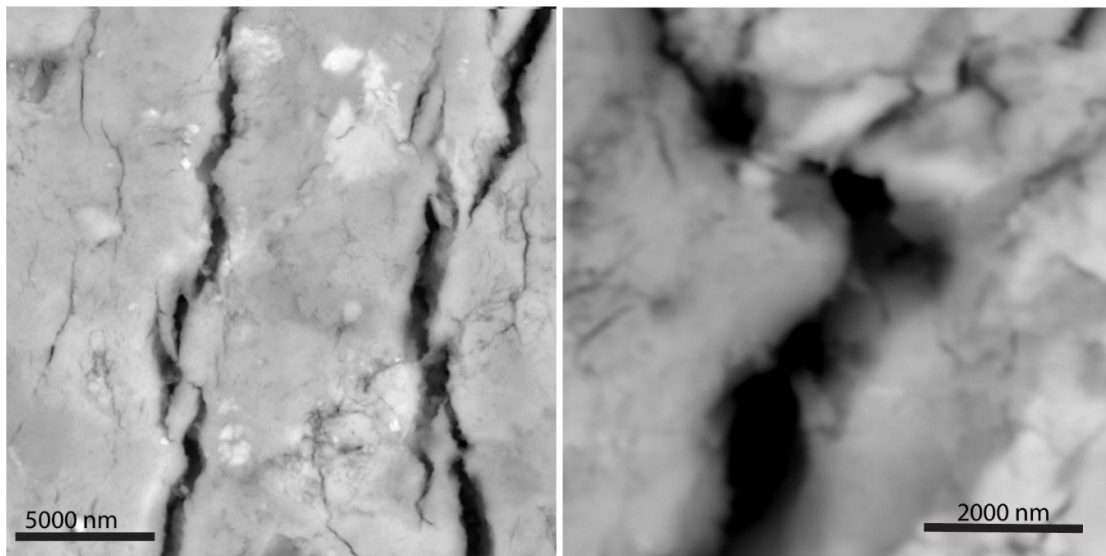## 1. Scanning Electron Microscopy Images

Figure S1. Environmental scanning electron images of cement reinforced with 0.5% wt Carbon NanoFibers.
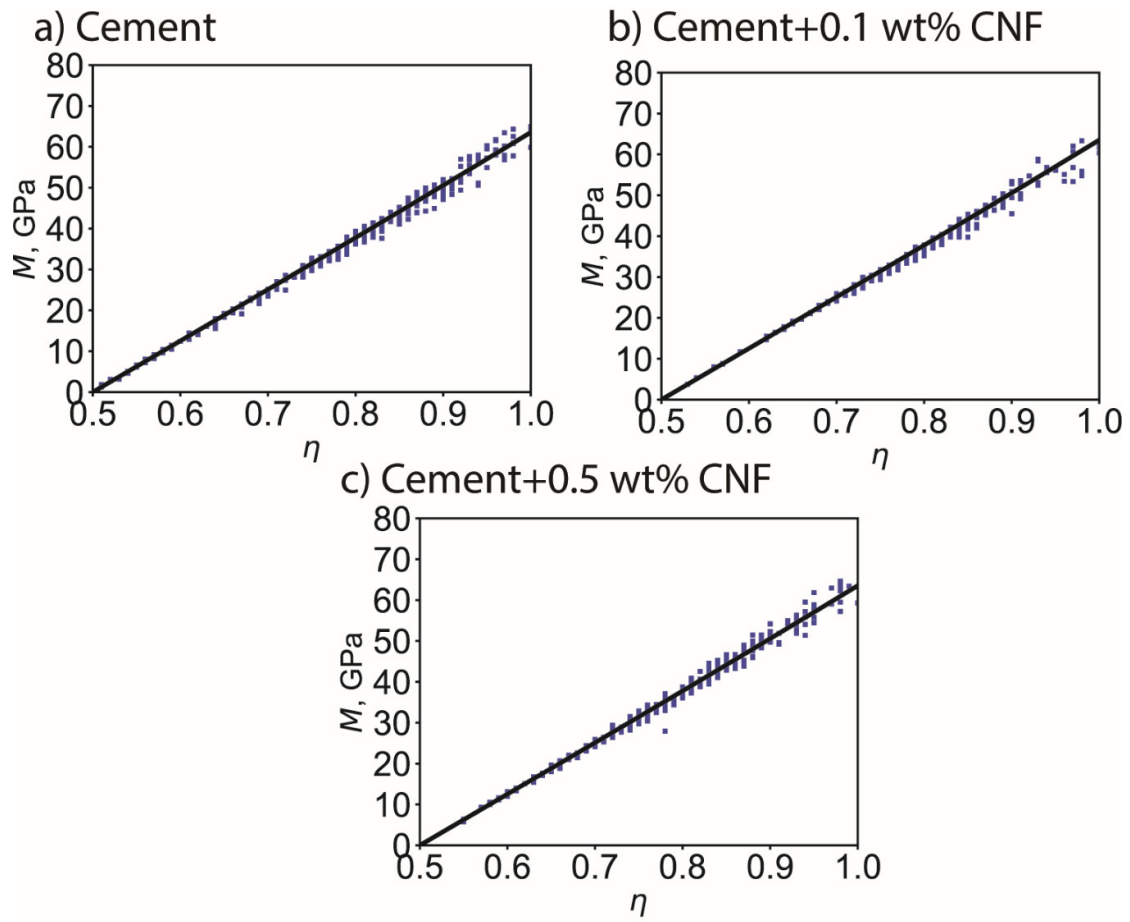
2. Fractography Analyses

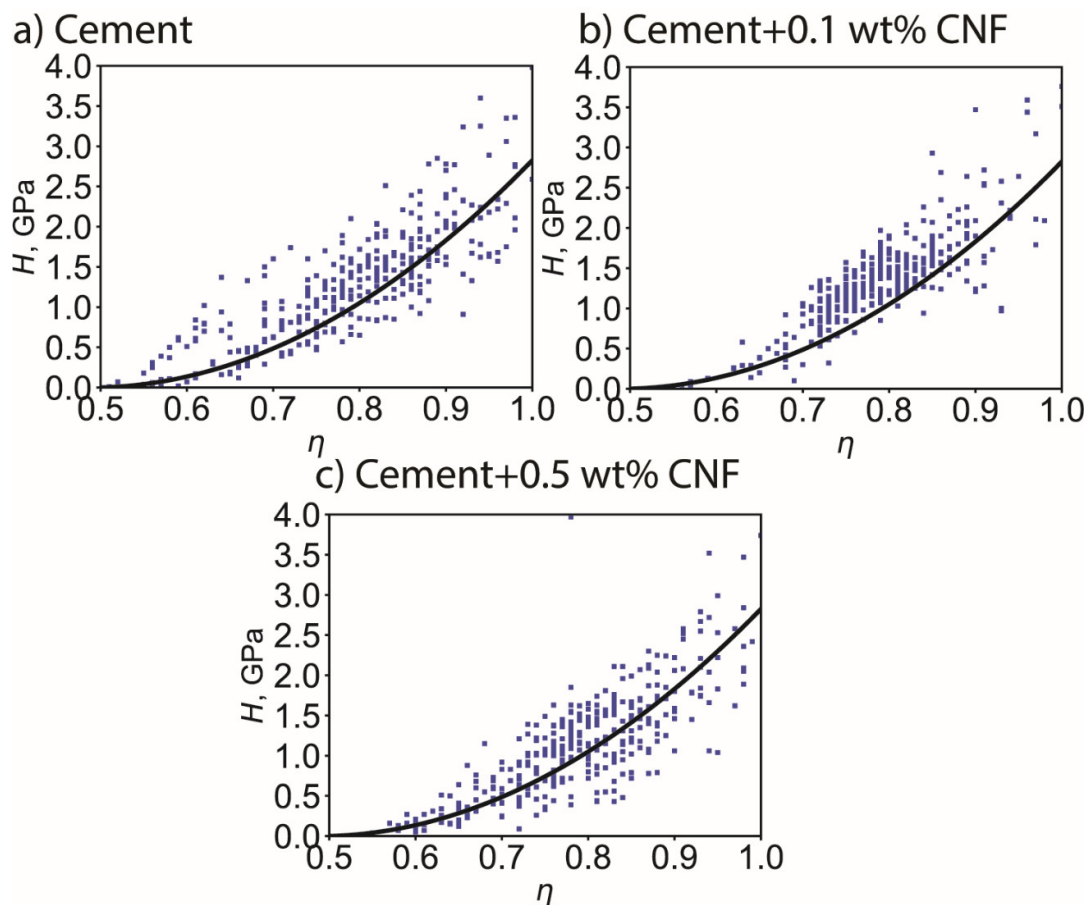**Figure S2.** Fracture micromechanisms of plain Portland cement.

Figure S3. Fracture micromechanisms of Portland cement reinforced with 0.5% wt CNF.

3. Micromechanics Upscaling Functions

Figure S4. Upscaling linear functions for the indentation modulus M. η is the local packing density. (**a**) Plain Portland cement. (**b**) Portland cement + 0.1 wt% CNF. (**c**) Portland cement + 0.5 wt% CNF.

Figure S5. Nonlinear upscaling for the indentation hardness H. η is the local packing density. (**a**) Plain Portland cement. (**b**) Portland cement + 0.1 wt% CNF. (**c**) Portland cement + 0.5 wt% CNF.