

# **Correlation Analysis between Defect size and Temperature of nano-cementitious composites using Heating Generation Test and Statistical Analysis**

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To enhance the multifunctionality of construction materials, ongoing research focuses on the integration of cement, a fundamental component of concrete, with carbon-based nanomaterials possessing high thermal and electrical conductivity. However, nano-cementitious composites can exhibit internal defects due to the agglomeration of nano materials during the fabrication process. In this study, the heat characteristic of nano-cementitious composites was utilized to detect internal defects, and statistical analysis was conducted to quantitatively analyze the correlation between defect size and temperature. Multi-Walled Carbon Nano Tube (MWCNT) was used as the nano material, and the test specimens were prepared by incorporating 1wt% MWCNT into the cement paste. The internal defect sizes were defined as 5%, 10%, 15%, 20%, and 25% of the area ratio of the specimen. After 28 curing days, the heating generation test was conducted and thermal images and temperature data. This study found that internal defects could be detected through changes in thermal images and temperature data. The correlation between defect size and temperature was analyzed using skewness and kurtosis. The skewness showed high linearity, but kurtosis displayed irregularities due to localized temperature concentrations in the specimens. Consequently, this study demonstrates the feasibility of detecting internal defects in concrete structures containing nanomaterials through heating generation test and non-destructive testing methods.