

Non-destructive Evaluation of construction materials using thermal and dielectric properties

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Abstract The in-situ determination of the thermal conductivity and dielectric properties of building materials is fundamental for solving problems related to building inspections and energy evaluations. However, the measurement is typically not conducted due to time-consuming methods and restrictive boundary conditions. Therefore, this project develops a new non-destructive testing approach to predict thermal conductivity by utilizing dielectric properties. With regard to this, the four wood materials, insulations, and concrete were tested in this work. Firstly, we aim to establish a correlation between thermal conductivity and dielectric properties of some commonly adopted building materials, as shown in Fig. 1. Further research is required to ascertain the continuity of this correlation in wall assemblies. Moreover, both thermal conductivity and dielectric properties increase with increased moisture levels, consequently, it is interesting to explore the effect of moisture constant on both properties. Detection of moisture variation will be also assessed in lab and on real construction to be validated.

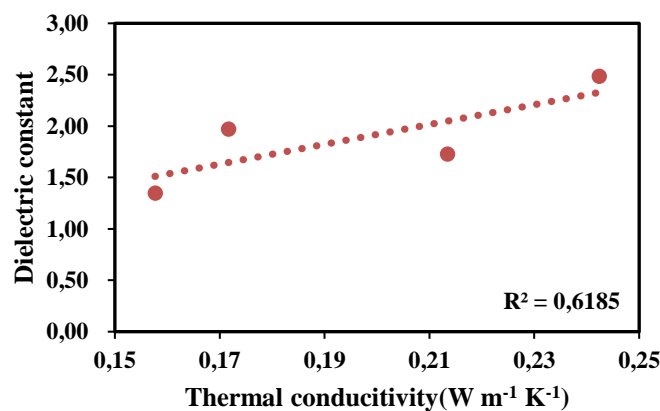


Figure 1. The distribution of dielectric constant and density with respect to thermal conductivity.

Keywords: Thermal conductivity, Relative dielectric constant, Non-destructive testing