

# **Ultrasonic Assessment of Internal Curing in Slag-based Cementless Composites Incorporating Cellulose Microfibers**

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The main objective of this study is to assess the internal curing impact of cellulose microfibers (CMFs) in slag-based cementless composites using ultrasonic-based non-destructive (NDT) technique. Ultrasonic parameters: diffusivity, dissipation, and relative velocity change within a frequency range of 600-800 kHz were used to characterize the impact of the internal curing. Cubic (50 mm × 50 mm × 50 mm) and cylindrical (100 mm × 200 mm) samples were prepared incorporating 5 mm length CMF with different amounts (0%, 0.6%, and 1.5%). Diffuse ultrasonic tests were conducted at various curing stages until 28 days, to precisely assess microstructural changes. Additionally, the hydration characteristics of the composite were examined using microstructural analyses such as TGA, FT-IR, and MIP methods. The results demonstrate that CMFs enhance hydration effects, with increased CMF content leading to improved formation of hydration products due to internal curing effect. Notably, ultrasonic parameter dissipation effectively indicates hydration effects, showing a higher rate of decrease with a higher CMF content over the curing period. The relative velocity change also displays an upward trend with curing age, with a higher CMF content indicating a greater increase with the development of hydration products. This research addresses the need for advanced monitoring techniques in cementless composites using non-destructive techniques.