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Microwave-absorbing building materials: Assessing thickness and antenna separation in fly ash-ladle furnace slag one-part geopolymer

Abstract

This paper aims to examine the effect of thickness (20, 40, 60, 80, and 100 mm) and antenna separation (20, 40, 60, 80, and 100 mm) on microwave absorption ability of fly ash-ladle furnace slag one-part geopolymer. The one-part geopolymers exhibited a dense structure with a good compressive strength of 39.2 MPa, which satisfies the minimum requirement for structural building (>28.0 MPa). The geopolymers had good dielectric properties with a low dielectric constant and increased dielectric loss and loss tangent, subsequently contributing to the microwave absorption properties. The microwave absorption ability increased from 60.0% to >80.0% at an optimal thickness of 100.0 mm and antenna separation of 20.0 mm. The presence of calcium-silicate-hydrate (C–S–H) refined the microstructure and enhanced the microwave absorption performance. This work offered an optimal thickness and antenna separation to maximize the microwave absorption ability, which is crucial for reducing microwave interference and preventing public exposure in regions with widespread deployment of Wi-Fi and 5G networks.

Keywords

Antenna separation; Fly ash; Ladle furnace slag; Microwave absorption; Thickness