Abstract

This study investigates how the composition of calcined clays affects phase formation and the flexural strength of autoclaved fiber cement. X-ray diffraction (XRD) shows that reactive Al2O3 from calcined clay promotes the formation of Al-substituted tobermorite during hydrothermal curing, thereby increasing flexural strength. The extent of aluminum incorporation into Al-tobermorite increases with the calcined clay's reactive Al2O3 content. However, excessive reactive Al2O3 hinders Al-tobermorite formation, leaving clinker phases dehydrated and markedly reducing flexural strength. These findings indicate that calcined clays derived from low-kaolinite sources, which contain more quartz and less reactive Al2O3, can be used at higher replacement levels in autoclaved systems. In contrast, clays with high reactive Al2O3 content should be used cautiously, as excessive incorporation impairs Al-tobermorite formation and reduces flexural strength. Therefore, in terms of performance, cost, and availability, low-kaolinite calcined clays are the preferred choice.