

Mechanistic Insights into Cold Sintering of Aluminosilicate-Based Powders: Evidence from Dissolution and Intergranular Phase Evolution

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Cold sintering has emerged as an effective low-temperature densification route for a wide range of ceramic systems, relying on dissolution–precipitation mechanisms promoted by a transient liquid phase under applied pressure. In this study, a natural aluminosilicate-based material, namely a volcanic ash originating from Mount Etna, Sicily, is investigated to elucidate the chemical and microstructural mechanisms governing cold sintering, with particular emphasis on dissolution-precipitation processes. The effects of key cold sintering parameters, including applied pressure, processing temperature, and the molarity of the transient KOH solution, are systematically evaluated in terms of densification behavior as well as chemical and microstructural evolution. The resulting materials exhibit relatively low thermal conductivity combined with good mechanical strength, which can be attributed to the nature and distribution of dissolution–precipitation products formed during sintering. The dissolved species and their subsequent reprecipitation at particle contacts can influence the characteristics of the intergranular phases and, consequently, enable tunability of the final mechanical properties.

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No interest

Invitation letter for visa

No

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