# DEM Study on the Role of Thermal Mismatch in Multi-phase Particle Fragmentation

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## ABSTRACT

A surprisingly large amount of the world's energy is consumed in cement production, from which a significant portion is spend on clinker grinding. Yet, the understanding of fragmentation processes of heterogeneous clinker particles, that are composed mainly of Alite (C3S), Belite (C2S), and a more or less amorphous matrix, as well as voids, is largely incomplete, resulting in a substantial potential for optimization. Phenomenological studies on fragmentation mechanisms [1-3] focused on the role of heterogeneity in impact comminution, assuming a more or less stress free, undamaged impacting particle. The DEM simulations revealed, that the dynamic stress field evolution of the impacting homogeneous sphere dominated disorder for material parameters within reasonable bounds. In cross-sectional images of clinker particles, however, intense cracking is visible, that could originate from quenching.

We present numerical simulations using the Discrete Element Method in three dimensions to study fragmentation of multi-phase particles that prior to impact have undergone a thermal shock due to quenching. We analyze the stress state due to quenching, its influence on fragmentation mechanisms and fragment size distributions.

## REFERENCES

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