# Homogenization Methods of Lattice Materials

Subjects: Crystallography

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The existing methods for analyzing the behaviors of lattice materials require high computational power. The homogenization method is the alternative way to overcome this issue. Homogenization is an analysis to understand the behavior of an area of lattice material from a small portion for rapid analysis and precise approximation. This paper provides a summary of some representative methodologies in homogenization.

homogenization method | lattice materials | periodic cellular materials | multi-scale mechanics

The homogenization approach is based on the idea that the properties of a heterogeneous medium can be determined by analyzing a small portion of it [1]. In other words, Representative Volume Element (RVE) is a sample for the entire area. It needs to be underlined that the RVE includes the micro-structural property of effective materials and expands to the global domain, where uniformly applied strain or stress exists with a boundary condition [1][2][3], which does not require extensive and full-scale simulations. Meanwhile, this strategy is only applicable when the homogeneities are dual orders of magnitude that are below the effective medium's characteristic length [1][2][3].

The idea of lattice material homogenization is represented where the RVE is a square unit cell. A body Ω with a periodic lattice with a *t* at the traction boundary Γt, a displacement *d* at the displacement boundary Γd, and a body force *f* is inserted by a homogenized body $\overline{\Omega}$. The mechanical properties of RVE are to be determined by the macroscopic behavior of Ω and $\overline{\Omega}$ are equivalent [1].

## References

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