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**Asymptotic models for transport properties of densely packed, high-contrast fibre composites. Part II: Square lattices of rhombic inclusions and hexagonal lattices of circular inclusions**

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### **Abstract**

This paper is a continuation of the investigations reported in the Part I. Based on the asymptotic approach and the lubrication theory, the composite with rhombic inclusions are studied. Models of composites with curvilinear rhombic inclusions and thin interfaces on phase boundaries are constructed with the help of non-smooth argument substitution and asymptotically equivalent functions. The effective conductivity is derived for absolutely conducting and non-conducting rhombic inclusions, taking into account thin interface effects.

Generalisation of the classical Dykhne formula is proposed. Finally, asymptotic solutions are obtained for the effective conductivity of a hexagonal lattice with circular large-size and absolutely conducting/non-conducting inclusions.

**Key words:** Composite, transport property, homogenization, asymptotic approach, asymptotically equivalent function, nonsmooth argument substitution.

### **1. Introduction**

This work extends the investigations presented in paper [4]. Based on the combination of the homogenization [7] asymptotic homogenization [1,2,3,4,5,6,8,11,12,14], multiscale asymptotic approach [15], lubrication theory [3,4,9,12], non-smooth argument substitution [18,19,20], and the asymptotically equivalent functions method [1], the following problems have been discussed and solved:

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