

# Streszczenie rozprawy doktorskiej w języku angielskim Conductivity of the composites with fractures on the boundary of inclusions

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The subject of the presented work is boundary value problems modeling imperfections of the structure in the form of cracks at the boundary matrix-particles. They are important in theoretical and experimental physics because of estimation the effective properties of fibrous materials with the measure of their imperfections.

In the present work, a new approximate analytical formula for the effective conductivity of 2D dilute composites with poor conducting circular inclusions and cracks on the interface between inclusions and matrix is established:

$$\lambda_e \approx \frac{1 + \nu \langle \cos \frac{\psi}{2} \rangle}{1 - \nu \langle \cos \frac{\psi}{2} \rangle},$$

where  $\langle \cos \frac{\psi}{2} \rangle$  means the statistical averaged value of the cosines of the spanning angles and  $\nu$  stands for the concentration of inclusions. Let us consider a unidirectional fiber composites and a section perpendicular to the fibres direction, where fibers are presented as a circle. The size of the insulating crack  $\psi$  is determined by the central angle which spans the boundary fracture. On the rest part of the interface, the perfect contact conditions are given, i.e. the continuity of the temperatures and of the normal heat fluxes from the both sides of the interface (See Fig.1).

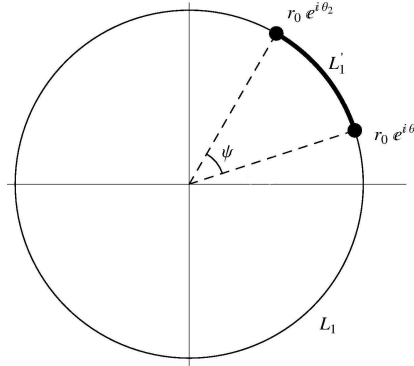


Figure 1: Circular inclusions with interfacial fracture  $L'$  of the angle length  $\psi$ .

This formula is obtained by means of Maxwell's approach, by application of the advanced methods of complex analysis and of conformal mapping.