



# An Edge Dislocation and a Heat Source at the Center of a Multicoated Circular Inhomogeneity

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## HIGHLIGHTS

- A closed-form solution for an edge dislocation in a multicoated inhomogeneity.
- A closed-form solution for a heat source in a multicoated inhomogeneity.
- The problem is reduced to a single linear algebraic equation.

**Abstract.** Closed-form solutions are derived to the problem of an edge dislocation or a steady line heat source at the center of a multicoated circular inhomogeneity by using the complex variable method and the transfer matrix method. The problem is reduced to a single linear algebraic equation which determines the single unknown real coefficient appearing in the complex stress functions defined in the surrounding matrix. The other unknown real coefficient in the complex stress functions in the inhomogeneity can then be conveniently determined.

**Keywords:** Multicoated Inhomogeneity; Edge dislocation; Heat source; Complex variable method; Transfer matrix method; Closed-form solution

## 1. Introduction

The determination of the elastic field induced by dislocations in composites is always a fascinating research topic in the mechanics and material communities [1]. Closed-form solutions exist when an edge dislocation is located inside or outside a circular inhomogeneity perfectly bonded to an infinite matrix [2-4]. However, generally speaking only series-form solutions can be obtained for an edge dislocation located at an arbitrary position in a three-phase composite in which a circular inhomogeneity is bonded to an infinite matrix through a coating layer [5-7]. On the other hand, thermal stress analysis of solids is important in practice and challenging in theory [8, 9] and has

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