

# **Coating Design due to Analytical Modelling of Mechanical Contact Problems on Multilayer Systems**

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## **Abstract**

This paper presents theoretical modelling of contact problems for the optimisation of coating elastic properties such that the stress distribution within a given load range will never reach values high enough to cause plastic deformation or fracture. Utilising the method of image charges in contact mechanics, simple, straightforward and efficient procedures for the evaluation of the elastic field within a layered material are obtained.

The model will be illustrated by means of a hypothetical compound consisting of a compliant metal substrate and a suitable film which shall simultaneously protect the substrate from plastic flow and avoid film cracking. Utilising the theoretical procedure mentioned above for up to three layers, an "optimal" coating is proposed which shows a distinct depth dependent variation of the elastic parameters (Young's modulus, Poisson's ratio).