

# Effect of Constitutive Equations on Qualitative Behaviour of Solutions in the Vicinity of Bi-Material Interfaces at Large Plastic Strains

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Severe plastic deformation is one of the main contributory mechanisms responsible for hard layer generation near frictional and bi-material interfaces [1]. Material flow within this layer is quite different from that in conventional tests used to determine material properties. Therefore, data from such conventional tests are not reliable for describing material response within the layer. Moreover, it is difficult to design a direct test that can be used to get reliable data. On the other hand, the qualitative behaviour of theoretical solutions near frictional and bi-material interfaces modeled by the maximum friction law depends on the constitutive equations chosen. In particular, some solutions predict the regime of sliding and these solutions are singular [2, 3]. Other solutions predict the regime of sticking and these solutions are not singular. The singular solutions predict severe plastic deformation near the interfaces. Therefore, the aforementioned qualitative difference in solution behaviour can serve as a criterion to choose an appropriate class of models to describe the generation of hard layers near frictional and bi-material interfaces.

The present paper focuses on analytic solutions to a boundary value problem for several widely used rigid plastic models. The boundary value problem consists of a motion of a rigid rod through rigid plastic material. The effect of constitutive equations on the qualitative behaviour of the solutions is demonstrated and connected to the aforementioned material behaviour near frictional and bi-material interfaces.

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