*Fracture of Brittle Solids by Applied Loads**

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CONTENTS

1. Introduction. As the condition for slip or yield, *i.e.*, plastic deformation, one usually assumes an equation involving the components of the stress field and a modulus of the solid which depends on strain hardening in practical applications; as examples we may mention the von Mises and Tresca yield conditions. This point of view regarding the initiation and maintenance of plastic deformation is well established in the literature. Nevertheless it cannot be applied effectively to obtain the solution of even the simplest mechanical problems due to the difficulties caused by strain hardening, *e.g.* the problem of the theoretical derivation of the linear relationships which were obtained by Bridgman in his experiments on the plastic deformation of steel cylinders under simple tension and hydrostatic pressure. Indeed Bridgman, using the von Mises yield condition, was not able to deduce these relationships nor was he able to account for a single one of the excellent experimental results described and documented in his book on *Large Plastic Flow and Fracture* [1]. Such facts constitute a severe indictment of the efficacy of conventional criteria for plastic deformation and flow in continuum mechanics.

I have investigated this matter under the assumption that the yield condition should imply only a *tendency* for the occurrence of slip over a surface element in the medium rather than the actual realization of slip as is commonly asserted. This investigation eventually led to the following two inequalities, namely

$$[(1 + k^2)^{1/2} + k]s_1 - [(1 + k^2)^{1/2} - k]s_3 \geqq 2K, \tag{1.1}$$

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