Progress Report

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Current work is aimed at studying the effect of strain rate on the void growth and to formulate a closed form solution for yield function for the pours material. The closed form yield function for spherical and cyllindrical voids shapes are already derived in Gursons classical work. Following this procedure and with new methods, numerous solution for yield functions are provided by various researchers over the year. In the present work, similar attempt is made to formulate a simple closed form yield function for matrix materials dependent on strain rate. Following the same procedure as Gurson, a yield function for power law materials with spherical inclusion is studied. For the initial studies, radial symmetry of the sphere is utilized, so as to reduce the difficulty of the problem.

For the satin rate dependent matrix, the solution for a spherical inclusion with radial symmetry is given by equation.

$$\sum_{nn} = \left(\frac{2}{3}\right)^{m/2} \frac{2\sigma_0 \dot{E}_{nn}^m \left(1 - f^m\right)}{m f^m} \tag{1}$$

Similarly for the axisymmetric problem, we get :

$$\sum\nolimits_{ij}' = \frac{\sigma_0}{3} \int_1^{1/f} Q^{(m-1)/2} t_{ij} X^{-2} dX \tag{2}$$

$$\sum_{nn} = \frac{\sigma_0}{3} \int_1^{1/f} 2DQ^{(m-1)/2} dX \tag{3}$$

The closed form solution can be obtained by solving the above two equations, at present various approximation methods are tested and we haven't been successful in obtaining closed form solution. The methods used for approximation are Taylor method and Gauss-Legendre. But the equation obtained can be solved numerically. A simple MATLAB program has been used to solve the equations and comparisons are made with available models and Finite element cell calculation.