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APPLICATION OF SPH METHOD FOR MODELLING PARTICULATE COMPOSITES

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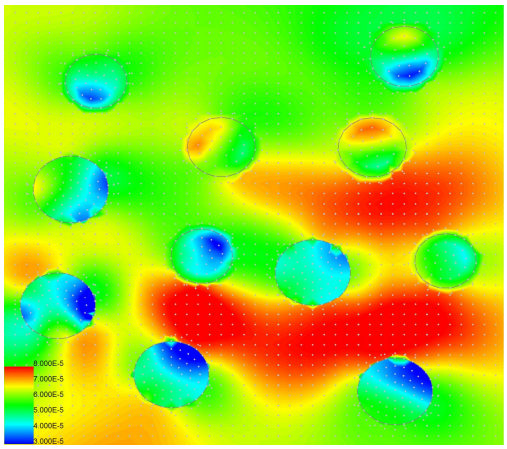
ABSTRACT

In recent years, the research and development of composites have received more attention due to rapid increase in demand for composites in various applications. The particulate composites have been used in many fields, for example, to produce functionally graded materials which are potential solutions to biomedical and other modern engineering applications. Many analytical and numerical methods have been developed to evaluate the effective properties and the failure characteristics of composite materials. The particle based methods such as SPH can be effectively applied to model particulate composites by exploiting the advantages of its meshless nature and the ability to model large deformation with fracture.

In this paper, the Smooth Particle Hydrodynamics method is applied to simulate the mechanical properties and fracture process of the particulate composites. The main emphasis is on applying SPH technique to model particulate composites and to develop related numerical procedures for such application.

To model particulate composites, it is essential to accurately model the interface characteristics between various phases of the materials in the composites. Here, a suitable interface model is presented with a number of examples to validate the proposed model. Further, the mechanical properties and the failure process or debonding of particles under tensile loading are simulated. The configurations of damaged material during the failure process are also analyzed. The numerical model developed in this article is based on corrected SPH method. This paper presents a number of numerical results to demonstrate the effectiveness of the developed methodology. Figure below illustrates a typical strain contours obtained, under unidirectional loading case, for a given particulate composite.



strain contour for unidirectional loading

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