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Title	Development of Hybrid Method Combining Discrete Element Method and Finite Element Method and Numerical Analysis on Particle Impact with Fragmentation

(800 words)

In brittle particle impact problem, behaviors of the particle after collision onto the target materials are crucial to understand the erosion of the target materials because fragmentation of the particle can change the contact time and the contact pressure between the particle and the target material. Other researcher results showed that impacts of the particle with fragmentation might produce damage on surface of the target material. Many researchers have examined the particle impact problem and the main attention was paid onto damage of the target material, but not particle itself. It is difficult to monitor fragmentation of the particle in impact problem since it occurs in extremely short duration. However, researches on brittle particle impact problem and its effect to the target material have not been carried out yet. In this research, impact of a glass particle onto a ceramic target material is evaluated. The effects of glass particle fragmentation on the ceramic target material are investigated. Therefore, a hybrid method combining FEM and DEM is developed in this research to obtain the understanding that fragmentation of the particle in impact problem has harmful effects for the target material.

Hybrid method has advantages inherited from both FEM and DEM. It can easily dealing with fragmentation of the particle and provides accurate stress calculation for the target material. So then, fragmentation of the glass particle and its effect to the ceramic target material can be recorded by this hybrid method.

According to the results of this research, hybrid method can clarify that impact of glass particle with fragmentation onto ceramic target material has harmful effects. Fragmented glass particle during impact generates high tensile stress in the sub-surface ceramic target material in tangential direction, in the case of two dimensional impact problems. This tensile stress generates failure in the ceramic target material and eventually causes damage and material removal on the surface of the ceramic material.