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Impact Fracture of Rock Materials Due to Percussive Drilling Action

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A theoretical model describing impact fracture of rocks caused by percussive drilling is presented. The process is modelled using particle dynamics (molecular dynamics) approach where a special interaction law for brittle materials is formulated. Relations between the microscopic quantities of the model and the macroscopic mechanical properties have been established. The material fracture and cracks formation under the periodic set of inserts are investigated showing that the impact fracture is concentrated in the areas directly under inserts, and also between them which is due to the shock wave interactions. The cracks distribution and their orientation differ significantly from the quasistatic computations and correlate well with the known experimental impact tests, and this confirms the dynamic nature of the considered process.

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