

Controlled blasting devices utilizing theremite charges and its applications to concrete demolition, rock bolts and dynamic loading machine

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Abstract

Thermite materials have been used for charges in blast-holes to break rocks or concrete blocks in urban area. Thermite materials typically include a mixture of a metal powder (as a fuel source) and a metal oxide. After ignition, the thermite materials exhibit deflagration rather than explosion. Although thermite reaction mixtures have been used in the demolition applications, few studies of the reaction mechanisms have been conducted. First of all, this study describes a method for monitoring continuously the combustion propagation behavior of commercial thermite reaction mixtures using conventional continuous VOD (velocity of detonation) measurement system. And this study introduces a controlled blasting system utilizing pyramid shaped charge holders and thermite materials for demolition of the desired part of concrete structures with minimized damages in the remaining part of the concrete(Fig. 1). A rapid installation rock bolt system which utilizes thermite reaction materials and blast ignition technique is suggested. After ignition of the thermite materials in the star-shaped steel tube, the deflagration reaction gases expand rapidly the steel tube and this expansion leads to friction between the tube and wall of borehole(Fig. 2). Finally, this study introduces the dynamic loading machines utilizing underwater blasting chamber of thermite reaction mixture to measure dynamic fracture properties of geomaterials in the range of intermediate strain rate.

Topics : Blasting Tools & Technics

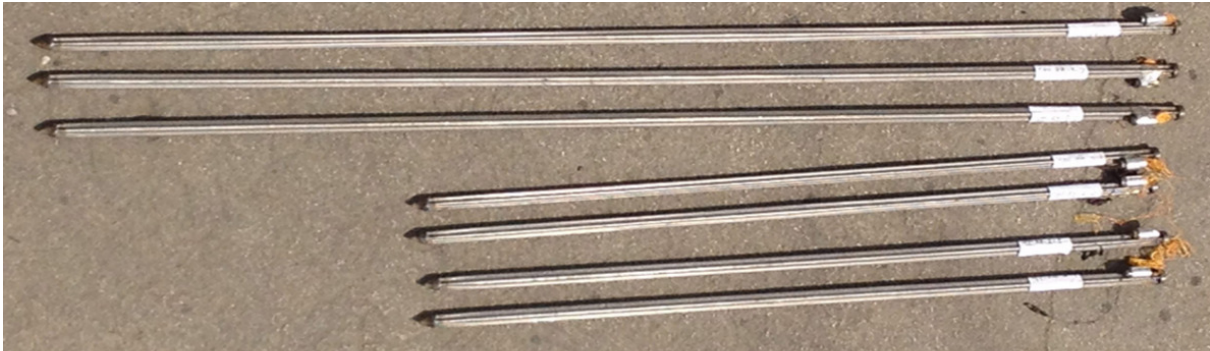


Diamond shaped charge holders



Pyramid shaped charge holders

Figure 1. Full scaled concrete demolitions using shaped steel plate charge holders utilizing a thermite ignition system



Star shaped steel tube rock-bolts utilizing thermite ignition system



Before ignition



After ignition

Figure 2. Rapid installable rock-bolt system utilizing a thermite ignition device