

Dynamic mechanical characteristics and application of constant resistance energy-absorbing supporting material

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Abstract: In deep underground engineering, rock burst and other dynamic disasters are prone to occur due to stress concentration and energy accumulation in surrounding rock. The control of dynamic disasters requires bolts and cables with high strength, high elongation, and high energy-absorbing capacity. Therefore, a constant resistance energy-absorbing (CREA) material is developed. In this study, the dynamic characteristics of the new material are obtained via the drop hammer tests of the new material and two common bolt (CB) materials widely used in the field. The test results of dynamic impact test show that the percentage elongation of CREA material is more than 2.64 times that of the CB material. The average elongation from a single impact is 45.6% lower than that of the CB material. These results indicate that the new material has high elongation and high energy-absorbing capacity, and can effectively resist impact deformation. Subsequently, the new bolts and cables using this constant resistance energy-absorbing material are developed, which are applied in roadways with strong rock burst proneness and strong dynamic disturbance. The field monitoring results show that the constant resistance energy-absorbing bolts and cables can effectively control the rock deformation and ensure engineering safe.

Keywords: Constant resistance energy-absorbing; supporting material; dynamic impact tests; mechanical characteristics; field application