An acoustic sensor for prediction of the structural stability of rock

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Abstract

Relatively small rocks that detach from stope hanging walls during periods when miners are working in the vicinity pose a lethal risk, and contribute significantly to underground fatalities in the South African mining industry, totalling 89 in 2014. The rock fall risks in deep rock mining are related to the behaviour of the rock surrounding excavations under high confining pressures. This is a particular concern in South African gold mines, where tunnels and stopes are excavated at depths of up to 4000 m. The failure of hanging walls has been an area of extensive research in rock mechanics,1 as it is the cause of many rock fall-related injuries and deaths. This workplace risk to miners is addressed by various standard mining practices, one of which is the entry examination procedure. Members of the entry examination team evaluate the hanging with the use of a pinch bar to both `sound¿ the rock and to bar it down safely, if it is found to be dangerously loose. 'Sounding' a rock is the evaluation of the rock's structural stability by judging the noise generated when the rock is struck by the pinch bar.