

EXPERIMENTAL INVESTIGATION OF THE FUMES PRODUCED BY MODERN COMMERCIAL EXPLOSIVES

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ABSTRACT

Commercial explosives exhibit non ideal behaviour which is very difficult to model. The fume spectrum produced by commercial explosives apart from its practical significance for underground mining is of great theoretical importance since it reveals information about the chemistry of the detonation process. Emulsions, watergels and dynamites were tested under various degrees of confinement in an one cubic metre closed chamber. Sand, concrete, steel and copper pipes were used to alter confinement. The degree of confinement was found to significantly influence the quantity (litres/kg of explosive) and the relative proportions of toxic and non-toxic fumes (percent of total fume measured). These results lead to further confinement testing using various rock materials. Fume results, and thus detonation performance were found to be dependent on the type of rock material used for confinement. Materials such as dolomite, limestone, and granite were found to result in a relatively high detonation efficiency of the subject explosive as shown by the distribution of detonation fume products. Conversely materials such as sandstone, talc and massive sulphide resulted in fumes suggesting low relative detonation efficiency. Fumes appear to be a sensitive indicator of the completeness of reactions occurring within the expansion zone of the composite emulsion explosive, while the detonation velocity is relatively insensitive to small variations in confinement. Estimates of sonic velocities of the confining rock materials were found to show no correlation with VOD results.

performance of an explosive as indicated by the resulting fume spectrum is affected by the degree of confinement.