CAPTURE OF PARTICLES PROJECTED BY A DETONATION USING AN AQUEOUS FOAM CONFINEMENT

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ABSTRACT

Over the past decades, the needs to mitigate detonation effects have significantly increased. To deal with these issues, the French Nuclear Energy Agency has studied aqueous foam confinement. Two objectives are put forward. Firstly, the presence of this two-phases medium leads to drastically attenuate the blast wave generated by the detonation of an explosive device. This first aspect was presented during the MABS 23. Secondly, the presence of the liquid phase slows down and ultimately captures the micrometric and potentially harmful particles dispersed by the explosion. This specific topic will be discussed in this paper.

Over the last year, we have conducted two series of experiments. The first one dealt with the dispersion of particles within the aqueous foam. To this end, 15 g of 50 µm mean diameter tungsten powder was propelled by a 10 g explosive charge. The dispersion of the powder was observed at different times by 3 X-rays radiographs. The comparison between air and foam presence clearly shows the reduction of the particle cloud velocity and dispersion within the foam.

The second experimental campaign studied the potential of an aqueous foam confinement to capture the particles. For this purpose, 200 g of 2 µm mean diameter tungsten powder have been dispersed in the air by a 44 g explosive charge. Confinements of various sizes were placed over the particles in order to quantify the ability of the foam to capture them. After the charge detonation, the particles in suspension in air were sampled and the results obtained from the different configurations were compared. We managed to quantify the capture ratio depending to size of the confinements.