

Aerosol explosion: hybrids and what else?

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The term 'aerosol explosion' includes dust explosion and mist explosion. However, whether they are solid or liquid, particles suspended in the air and subjected to an ignition source are far from giving rise to homogeneous monophasic reactions as in the case of gases.

Indeed, during the explosion of volatile powders or metal compounds with a wide particle size distribution, reactions are 'hybrid' as they can take place both at the surface of the powders as well as in the gas phase. In the context of organic powder explosions, the pyrolysis phase is an essential step and leads to a flame propagation in a hybrid medium composed of pyrolysis gases, unburned powders and char.

Finally, for hydrocarbon mist explosions: the vapor pressure of the liquid, and by extension the gas/liquid ratio of the cloud before ignition, plays a major role in their ignition sensitivity and explosion severity.

In summary, and somewhat exaggeratedly and provocatively: pure aerosol explosions do not exist! They always -or nearly always turn, at one point or another during the heating and combustion processes, into a hybrid mixture. By reconsidering dust or mist explosions from this angle, can we change our perception of these phenomena, our risk assessment procedures and our way of modelling them?

And what if hybrid explosion was the 'new normal'.