

Characterisation of aerosol combustible mixtures generated using condensation process

Abstract

An accidental release of a liquid flammable substance might be formed as an aerosol (droplet and vapour mixture). This phenomenon might be due to high pressure sprays, pressurised liquid leaks and through condensation when hot vapour is rapidly cooled. Such phenomena require a fundamental investigation of mixture characterisation prior to any subsequent process such as evaporation and combustion. This paper describes characterisation study of droplet and vapour mixtures generated in a fan stirred vessel using condensation technique. Aerosol of isooctane mixtures were generated by expansion from initially a premixed gaseous fuel-air mixture. The distribution of droplets within the mixture was characterised using laser diagnostics. Nearly monosized droplet clouds were generated and the droplet diameter was defined as a function of expansion time. The effect of changes in pressure, temperature, fuel-air fraction and expansion ratio on droplet diameter was evaluated. It is shown that aerosol generation by expansion was influenced by the initial pressure and temperature, equivalence ratio and expansion rates. All these parameters affected the onset of condensation which in turn affected the variation in droplet diameter.