

Environmental Safety Assessment During Rocket Combustion

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Abstract

Many of the present solid propellant systems contain composite propellant which consists of an energetic oxidizer (Ammonium perchlorate, AP), a metallic fuel (Aluminum, Al), a polymeric binder (Hydroxy terminated polybutadiene, HTPB) and diisocyanates as curing agents. A typical liquid propellant used in missiles consists of G-fuel (equal mixture of xylidene and triethylamine) and red fuming nitric acid (RFNA). G-fuel which contains triethylamine with very high vapour pressure is a big fire hazard. Xylidene is toxic whereas triethylamine is a strong irritant. Thus, launching of rockets and missiles from a test range produce toxic exhausts and pollutants to the local atmosphere. This has necessitated the study of nature of combustion products and their quantitative estimation. Effect of rocket launching on pollution of flora and fauna has been studied. It has been seen that, before launching of rocket, the level of toxic gases like Suspended Particulate Matter (SPM) ($40-50 \mu\text{g}/\text{m}^3$), oxides of sulphur, SO_x ($1-2 \mu\text{g}/\text{m}^3$) and oxides of nitrogen, NO_x ($6-10 \mu\text{g}/\text{m}^3$) etc are measured in ambient air. During rocket firing, the level of toxic gases in the air is increased to some extent but the concentrations are reduced after 1 h of rocket firing. A slight decrease in chlorophyll content as analyzed in few plants and an increase in noise level have been observed during launching of flight vehicles.

Key words: Rocket, Propellant, combustion, suspended particulate matter, gasses, heavy metals, impacts.