

ABSTRACT

Composite rocket propellants are most frequently being used today for various scientific and space exploratory missions as well as for military offense and defense. These are blended with radical scavengers and hydroperoxide decomposers as antioxidants so as to avoid time dependant aging by autoxidation proceeding through free-radical mechanism. This aging seriously affects the physical, mechanical and ballistic properties of propellants finally culminating into reduced shelf life.

Present study involves various compositions of propellants containing different concentrations (0.1%, 0.2%, 0.5%) of N,N'-diphenyl paraphenylene diamine, 2,2-methylene bis(4-methyl-6-tertiary butyl phenol) and 2,6-ditertiary butyl p-cresol as antioxidants. The samples were kept at 30°C and 60°C and the parameters analyzed were UTS and Elongation (by Hounsfield Tensile Testing machine), Hardness (by Shore A Durometer), Resilience (by Shore Resiliometer) and Burn Rate (by Strand Burner) for different concentrations. The results established that aging affects mainly UTS, Elongation and Burn Rate while Hardness and Resilience remain almost intact. It has been concluded that the appropriate antioxidant is N,N'-diphenyl paraphenylene diamine with optimum concentration 0.2% for the particular propellant composition, since it undergoes least change in burn rate as well as in mechanical properties and is stable for a longer period of time even at higher temperature.