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PIEZOELECTRIC CRYSTALS IN NOSE CONE & RE-ENTRY HEAT SHIELDS FOR GENERATION
OF ELECTRICITY & THEIR THERMAL INSULATION

Abstract

There is a lot of pressure as well as heat induced on the surface of nose cone and on the heat shield during atmospheric entry. With this large amount of pressure due to atmospheric drag, the temperature on the surface of the vehicle is excessive. The piezoelectric crystals can convert this air pressure and drag acting on the nose cone and heat shield to electricity so that energy is not wasted in the form of heat. This electricity generated can be used for many useful applications like powering a pump for cooling of the surface, power supply to the vehicle for carrying out some tasks on computer or other electronics, etc. Cooling of the heat shield is also required to avoid any mishap due to disintegration of the vehicle because of the extremely high temperature. It is highly inefficient to use retrorockets because it would require as much amount of fuel as it is used for sending rockets in space. I have considered the design aspects and have done calculations for the amount of current which can be generated by this method. I have also designed a heat shield which will use the pressurized atmospheric air to slow down the vehicle more efficiently. Cooling of nose cone and heat shield is also required in order to maintain the crystals for long term usage. Hence, cooling of heat shield and nose cone is also worked on. This paper provides a solution to both the problems by following a complete methodical approach of utilizing piezoelectric crystals to gain energy in the form of electricity during launch and atmospheric entry as well as to provide the housing of crystals with proper cooling and thermal insulation with a strong sturdy design during launch and atmospheric entry.