**Zero erosion and thermal shock resistant 3D NPP C-SiC composite Throat Inserts for dual/multi pulsed solid/liquid propulsion systems**

3D Non-woven NPP C-SiC throat insert

Ceramic Matrix Composites (CMC), are well known for their excellent thermo-mechanical properties and high temperature erosion resistance. There exists a huge demand for such materials where high temperature erosion and thermal shock is simultaneously encountered in applications such as Throat Inserts, Nozzles and Thrusters of propulsion systems.

A missile throat insert is made with typical configuration and is tested under highly erosive and corrosive exhaust gases with solid alumina particle impingement of solid propulsion particularly at the nozzle throat where high mass flux of the exhaust gases exert very high shear stresses in addition to the chemical/oxidative attack which results into a severe thermo-oxidative recession of the throat material.

3D non-woven NPP C-SiC throat insert having uniform mechanical strength and high thermal diffusivity, which gives very high thermal shock resistance property. Uniform carbon fiber orientation/network also provides high fracture toughness. The combination of uniform mechanical and thermal properties, high thermal shock and fracture toughness of the 3D non-woven NPP C-SiC throat insert make it ideal candidate for Throat application.

This material is processed as per DRDO Patent naming **“Advanced erosion and thermal shock resistant 3D NPP C-SiC composite Throat Inserts for dual/multi pulsed solid/liquid propulsion systems and their process of manufacturing”.** Major process steps are:

Siliconization

Densification

C-C Rigidization

Preforming

These processing involve various furnaces operating under inert/vacuum atmosphere with temperature between 1500C-30000C and pressure between 1 bar to 1000 bar.