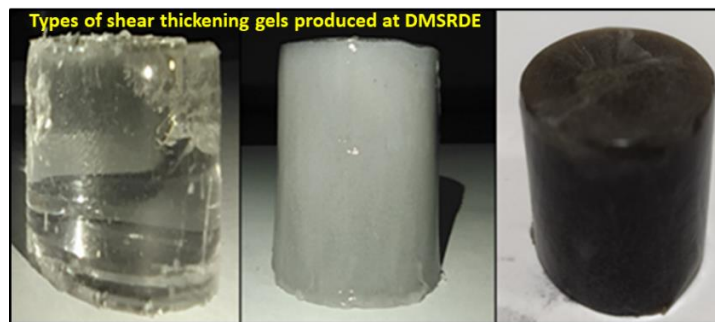


Processing and Material Technologies of Shear Thickening Gel Based Nanocomposites for Impact Resistant Applications

- Shear thickening fluid (STF) is the non-Newton fluid which increases its viscosity when shear rate exceeds a critical value. In most often, rate of increase of viscosity is slow in STF which is one of the major challenges for its application in dissipation of kinetic energy during impact
- Shear Thickening Gel (STG) shows more stable performance and it is easier to store compared to its fluidic form which helps to overcome the problems of particle sedimentation and liquid volatilization
- By optimizing the bonding and non-bonding interactions in the polymeric nanocomposite gels, DMSRDE has prepared unique SSG which shows the change in viscosity as a function of shear force and holds a great promise for damping and shock energy dissipation
- Flexible gel filled polymeric scaffolds/laminated composites have been prepared for efficient absorption of low to medium velocity impact



Prototype of flexible STG filled laminates have been prepared and tested for ballistic impact applications. The shear thickening mechanism resulted to efficient dissipation of energy by rearrangement of functional nanofillers due to squeezing out of polymeric matrix from the nanoparticle agglomerates which ultimately resulted into thickening of gel.

The composite structure possesses efficient dissipation of impact energies for development of dampers, shock absorption for gun recoil system, fortified bunkers or ballistic/blast impact personal protection system, anti-piercing shoe sole, stab resistant protective gear, blast/fire protection of Li ion batteries and Flexible self-powered triboelectric nanogenerator (TENG) etc.

Interested Industries are requested to forward their Expression of Interest (EoI) to Director DMSRDE, Kanpur (with attachments of supporting documents) with a copy of Director DIITM, DRDO HQ (without attachment) on following address:-

To,

Director**Defence Materials and Stores Research & Development Establishment (DMSRDE)**

DRDO, Ministry of Defence, Government of India

PO DMSRDE, GT Road,

Kanpur-208013

Phone : (0512) 2451759-78

Fax : 0512-2450404/ 2404774

E-mail ID : [director\[dot\]dmsrde\[at\]gov\[dot\]in](mailto:director[dmsrde@gov.in])

Copy to**Director****Directorate of Industry Interface & technology Management (DIITM)**

Room No. 447, DRDO Bhawan, DRDO HQrs, Rajaji Marg, New Delhi-110011

Phone: 011-23013209/23015291

Fax: 011-23793008

Email: [diitm\[dot\]hqr\[at\]gov\[dot\]in](mailto:diitm[hqr@gov.in])

List of Support documents to be attached with EoI

- a) Memorandum and Articles of Association (Should be incorporated as per Indian Companies Act, as amended time to time)
- b) Certificates of registration as a manufacturing unit, if any.
- c) Audited Balance Sheet for the preceding three years.
- d) Income Tax returns for the preceding three year period
- e) Details of shareholding/ownership pattern especially foreign partners/ shareholders, foreign employees, directors, etc. The company must adhere to the prevailing Govt of India policies and regulations on Foreign Direct Investment (FDI)/DIPP norms as applicable.
- f) Annual budget for R&D during last three years.
- g) Numbers and details of IPR or patents, etc., held by the company.
- h) Number of technically or professionally qualified personnel.
- i) Record of past performance (e.g., Supply orders executed against of Ministry of Defence orders, Public Sectors and Paramilitary Forces, if any).
- j) Availability of adequate infrastructure (List of machines and their production capacities) and technical expertise.
- k) List of Testing and Support equipment's
- l) ISO/ ISI certification or any other certification
- m) Relevant clearances form the authorities/ ministries (if any)

- n) Capacity and capability to undertake developmental work and to accept attendant financial and commercial risks.
- o) Capacity/capability to market the product through the marketing network, sales and service network, reliability to maintain confidentiality.
- p) PESO and DPIIT license for explosive handling if ToT is for high energy Material, explosives, propellants, and component/ system dealing with it etc (if applicable).
- q) Under taking form company seeking ToT that none of its Directors, Independent Directors, non-executive Directors, Key management personnel are involved in any corrupt practices, unfair means and illegal activities.
- r) Details of the industrials license for defence manufacturing be provided by the industry seeking ToTs.