**National Institute of Technology, Hamirpur (HP)**

**Incubation Centre**

**Innovative Research Incubation Club (IRIC)**

**Project Proposal Form-2017**

1. **Faculty Name:** Dr. Vimal sharma
2. **Department:** Physics
3. **E-mail ID: -**
4. C**ontact No.:** : --
5. **Research/ Project Title:**  Synthesis of CNT reinforced Al/MoO3 nao-thermite for application in high energetic materials
6. **Research/ Project Description:** In order to synthesized and study the properties of aluminium /CNT/ HEs composite we propose following steps.

• Synthesis – Synthesis of Al/CNT+ MoO3 nano-composite powder as an ingredient for high energetic materials. – Creating a database of synthesis conditions which can be used for its application in high energetic materials.

• Characterization – Structure (at nanometer size) - XRD, SEM, EDS and Raman Spectroscopy. – Property measurement (Materials phenomenon at nanoscale) DSC Exothermic energy release with variable CNT weight fraction.**.** Methadology The applications of CNTs in metallic composites have been reported. The dispersion and processing problems, however, are the main obstacles for good metal- CNTs composites due to the strong van der Waals forces of attraction between these long and thin tubes. Compared with the polymer-CNTs composites, the mixing process of metal-CNTs is more difficult. For homogenous dispersion of carbon nanotubes in the matrix a wet chemical route with following steps is proposed.

WET CHEMICAL METHOD

• For Al/CNT nano-composite powder

– Dispersion of the CNT in solvent like DMF/Hexene, sonication of the solution for 2-3 hours for dispersion.

– Addition of surfactant like SDS for better dispersion and stable solution.

– Mix aluminium nano-powder in the solution by gentle stirring for one-hour.

– Separation of Al/CNT nano-powder by ultra centrifugation

– Drying at low temperature for evaporating the solvent.

• For synthesis of High energetic material/Explosive

– Mixing: Appropriate amount of Al/CNT+ MoO3 nano-powder in solvent

– Dispersion: Proper ultrasonication for homogenous dispersion of ingredients

– Drying: Heat in vacuum at low temperature to remove solvent

• Merits of synthesis method

– Better and stable dispersion of carbon nano-tubes with intact structure is obtained by sonication in presence of surfactants.

– Metal nano-particles are mixed in CNT solution in presence of stabilizing agent which prevent aggregation and improve stability of the nano-particles.

– The solution based processing and assembly can be readily implemented.

– The large quantity of nano-composite powder can be synthesized.

– No special equipment is required

1. **Project Completion Time: Long term(More than one year)**
2. **Student Skills Required, Pre-requisites (if any):**
3. **Number of Students Required (UG/ PG) for the project:**