# PONDICHERRY UNIVERSITY

**School of Physical, Chemical & Applied Sciences**
**Department of Physics**

**Invited Lecture**

**On**

## Energy carriers in self-confined nano materials and applications

**By**


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**Materials Science Centre and School of Nanoscience and Technology**
**Indian Institute of Technology**
**Kharagpur – 721 302**


Date : 10.02.2015
Time : 3.00 p.m.
Venue : Raman Seminar Hall, Department of Physics
Pondicherry University
Puducherry – 605014

**ALL ARE WELCOME**

03/02/2015

Dr. G. Chandrasekaran
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# Energy carriers in self-confined nanomaterials and applications

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A nanomaterial (metal, alloy, compound, or a composite) consists of self-confined geometrical dimension 0-D, 1-D, or 2-D. Thermodynamically, it adapts a high-energy macroscopic state and it involves dynamic energy carriers. Classification of such materials will be described with selective examples of value aided materials. Owing to high-energy, a nanophase serves rather susceptible of coordinating to a foreign phase such as exfoliated graphene in the form of a stable over layer (of a few atoms thickness) - a technologically important inorganic-organic nanohybrid material. Carbon atoms with hybridized $sp^2$ electrons and spins on a noble metal surface such as Au-$5d^{10}6s^1$ can breed an electronic bed of a joint interface. Localized surface charge carriers, phonons and magnons in such a hybrid phase largely influence collective oscillation of electrons in the bed so called "Surface plasmons". Such novel materials offer unique energy transfer in terms of localized "surface plasmons" as per effective shape with confined local phonons, spins, and average surface charge carriers. For example, a single SPR band appears at 520 nm in 0-D gold while two distinct modes split on 1-D and 2-D gold, wherein the longitudinal mode shifts sensitively over 700-1000 nm regime on increasing the aspect ratio as it is required for some medical diagnostics. Different kinds of energy carriers present in a metal nanocomposite modulate excitation and de-excitation of correlated processes in a "single pool" following a light perturbation. Novel results collected in our laboratory on synthesized optical materials over the years will be discussed with selective nanohybrids dispersed in different dielectric hosts as nanofluids and derivatives. Results find uses in developing dynamics of different kinds of energy carriers in functional materials for medicals, biosensors, energy-converters, surface coatings, photocatalysts, camouflage, and other applications.