





Optical Vibration Monitor, NPOL, Kochi

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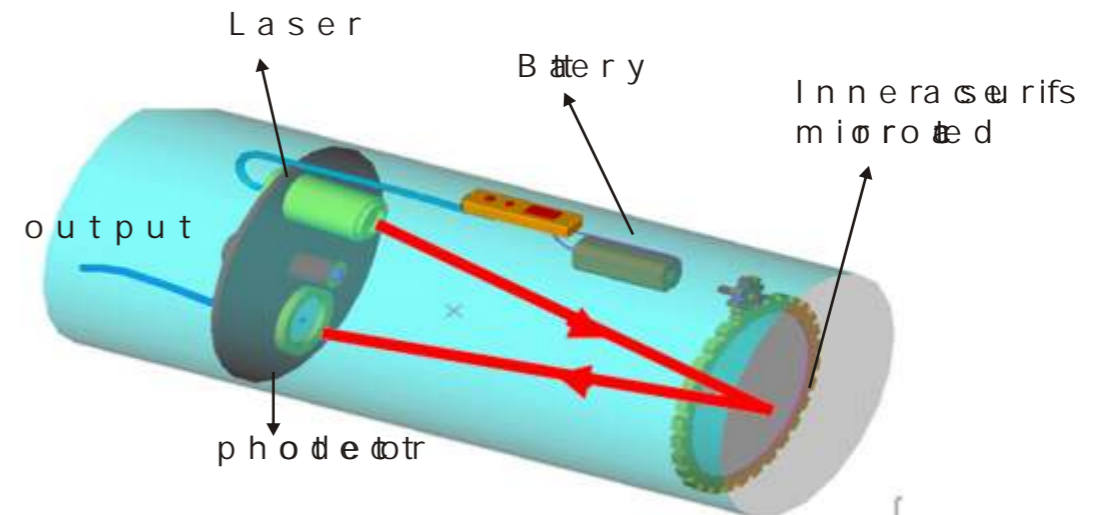
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Applications

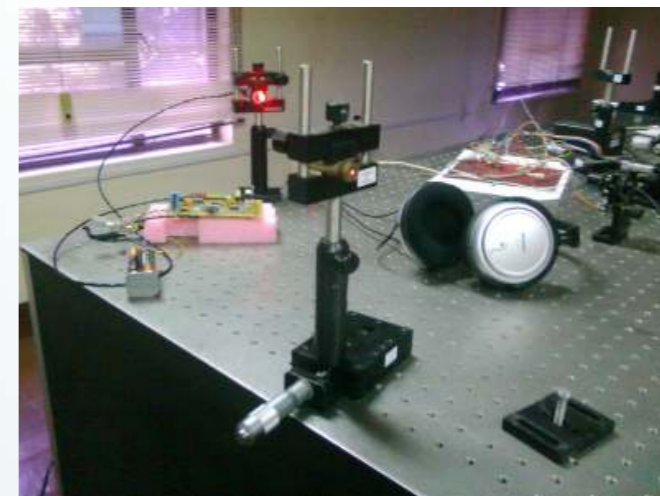
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- Applications include:
 - Non-destructive testing of structures.
 - Monitoring of machinery vibration.
 - Structural health monitoring of bridges and buildings.
 - Vibration analysis of rotating machinery.
 - Seismic monitoring of structures.
 - Vibration analysis of power plants.
 - Vibration analysis of aircraft.
 - Vibration analysis of ships.
 - Vibration analysis of offshore structures.

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Schematic of apparatus



Laboratory prototype experiments

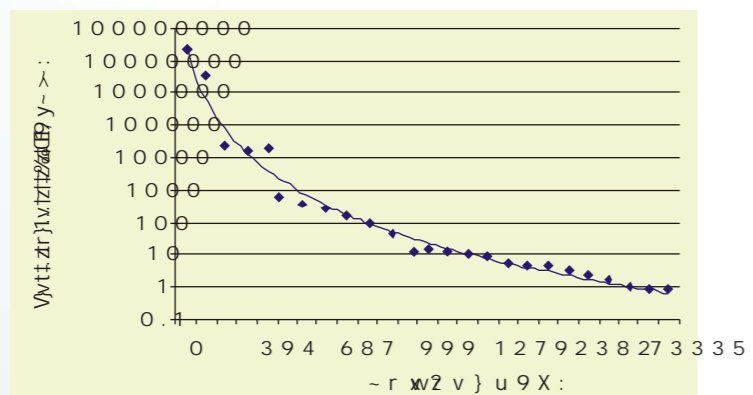
Magneto-Resistive Fluid, NPOL, Kochi

The NPOL Magneto-Resistive Fluid is a novel material developed by NPOL, Kochi. It is a liquid crystal-based material that exhibits a significant change in resistivity when subjected to a magnetic field. The material is composed of a mixture of liquid crystal molecules and conductive particles. The resistivity of the fluid decreases as the magnetic field strength increases, and this effect is reversible. The material has a wide range of applications, including in sensors, actuators, and smart materials. The resistivity of the fluid is typically in the range of 10^3 to 10^5 Ohm-cm, and it can be tuned by varying the concentration of the conductive particles and the liquid crystal molecules. The material is also highly stable and has a long shelf life.

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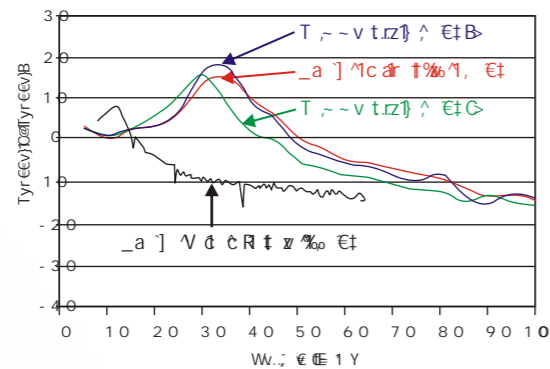
- ❖ Non-volatile memory
- ❖ Magneto-resistive sensor
- ❖ Smart material / smart sensor
- ❖ High temperature devices
- ❖ Microfluidic devices
- ❖ Variable resistors



Variation of resistivity with magnetic field

Magneto-Rheological Fluid, NPOL, Kochi

Magneto-rheological fluid (MRF) is a smart material whose viscosity can be controlled by an external magnetic field. It is a suspension of ferromagnetic particles in a carrier fluid. When a magnetic field is applied, the particles align and form a chain, which increases the fluid's resistance to flow. This property is used in various applications such as shock absorbers, dampers, and vibration mounts. NPOL is a leading manufacturer of MRF products in India. The company has developed a range of MRF products for various applications, including automotive, industrial, and aerospace. The products are known for their high performance, reliability, and long life. NPOL MRF products are used in a wide range of applications, including shock absorbers, dampers, and vibration mounts. The products are known for their high performance, reliability, and long life. NPOL MRF products are used in a wide range of applications, including shock absorbers, dampers, and vibration mounts.



Transmissibility characteristics of various mounts based on MR fluid



Damper based on magnetorheological fluid



Vibration mount based on magnetorheological fluid

Fluid Motion Monitor, NPOL, Kochi

The device is a compact, rugged, and reliable system for monitoring fluid motion in a wide range of applications. It is designed to be used in harsh environments, such as offshore oil and gas platforms, where it can provide accurate and reliable data for process control and safety. The device is also suitable for use in marine and industrial applications, where it can monitor the flow of liquids and gases in pipes and tanks. The device is easy to install and maintain, and it provides a long service life. The device is also suitable for use in research and development applications, where it can provide accurate and reliable data for the study of fluid motion.

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- ❖ A p p a a u f s r e a t l i m m e o r i r t i o f i d i e r s c e a n .
- ❖ A p p a a u f s r e a t l i m m e o r i r t i o f e n s i t y n i g t e s e c e a n .

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- ❖ A p p a a u f s r e a t l i m m e o r i r t i o f e a c r u e r t i s r t h o c e a n .
- ❖ S i m p h o a b a e p p a a u f s u n d e t e w e i s c r i t i c a l r b a n c e s .
- ❖ A p p a a u f s d e e t c t o f y d o d y n a d r i t s u r b a i n t h o e s e a n .
- ❖ A p p a a u f s o r d e e t o g p r s e r e v b o r o t s i n a n y o p d a y t r s p r e t m d u m a t m o s p h e r



Encapsulated Photo detector with a glass window



Encapsulated laser diode with a glass window



Packaged opto-electronic system for underwater experiments

Syntactic Foam, NPOL, Kochi

Syntactic foams are special materials developed in India by the Institute of Space and Technology, Thiruvananthapuram. These foams are used in various applications such as in the construction of balloons, floats, and other marine equipment. The foams are made from a mixture of a polymer matrix and glass or ceramic particles. The particles are dispersed in the polymer matrix to create a porous structure. The foams are lightweight and have high strength. They are also resistant to water and corrosion. The foams are used in various applications such as in the construction of balloons, floats, and other marine equipment. The foams are made from a mixture of a polymer matrix and glass or ceramic particles. The particles are dispersed in the polymer matrix to create a porous structure. The foams are lightweight and have high strength. They are also resistant to water and corrosion. The foams are used in various applications such as in the construction of balloons, floats, and other marine equipment.

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Properties of syntactic foams developed at NPOL

Type	Density (gm/cc)	% Water absorption	% Volume Compressibility	Bulk modulus (kg/cm ²)
1	0.21	3.96	20.17	99.15
2	0.38	1.60	4.75	421.05
3	0.42	1.29	3.58	558.60
4	0.60	0.93	2.16	925.46
5	0.70	0.78	1.64	1219.51
6	0.80	0.53	1.18	1694.91



Buoyancy module for towed array



Floats for fuel gauge made with syntactic foam

Ceramic Tiles, R&DE(E), Pune

The present innovation is a unique high strength ceramic tile for use in the construction of the roof of the building. The tile is made of a special composition of ceramic materials and is designed to be used in the construction of the roof of the building. The tile is made of a special composition of ceramic materials and is designed to be used in the construction of the roof of the building.

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Remotely Operated Vehicle (ROV), R&DE(E), Pune

The Remote Operated Vehicle (ROV) is a land-based mobile robot used for various applications, including search and rescue, environmental monitoring, and industrial inspection. It is designed to be operated remotely via a control station and a communication link. The ROV is equipped with various sensors and actuators to perform its tasks. It is used in a wide range of environments, including indoor and outdoor spaces. The ROV is a versatile and powerful tool for many applications.

Work Features

- Robotic Remote Operated Vehicle (ROV) is a land-based mobile robot used for various applications, including search and rescue, environmental monitoring, and industrial inspection.
- The ROV is designed to be operated remotely via a control station and a communication link.
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Key Features

Process is safe & efficient. It is a low weight & compact device.

Hydrogen storage capacity is high. It is suitable for applications where high pressure hydrogen is required. It is a safe & efficient device. It is a low weight & compact device. It is a safe & efficient device.

Key Features

	Volume m ³ /Kg.H containment	Wt. of H/ Kg. alloy	Pressure (atm.)
Gas Cylinder	0.075	0.011	164
Hydrogen KT	0.0225	0.0098	37

Key Features

- Low weight
- Low pressure
- High capacity
- Safe & efficient
- Suitable for applications
- High pressure hydrogen
- Safe & efficient
- Low weight
- Low pressure
- High capacity
- Safe & efficient
- Suitable for applications

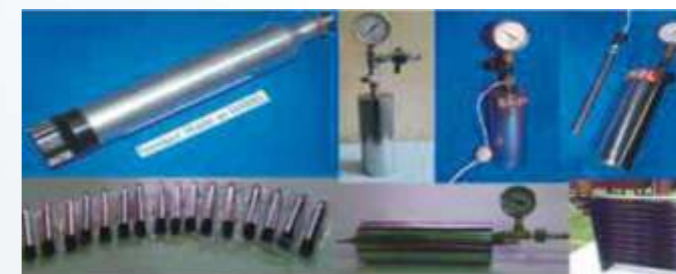
Key Features

DMRL is a safe & efficient device. It is a low weight & compact device. It is a safe & efficient device. It is a low weight & compact device. It is a safe & efficient device.



- Hydrogen Capacity: 100 cc
- System Volume: 0.6 liter
- System Weight: 2.5 Kg
- Hydrogen mass: 1.5 Kg
- System Pressure: 2.5 atm

The capacity of the system is high. It is a safe & efficient device. It is a low weight & compact device. It is a safe & efficient device. It is a low weight & compact device.



Cu-Ti Alloy, DMRL, Hyderabad

DMRL developed a non-sparking tool made of Cu-4.5Ti alloy for use in the maintenance of aircraft. The alloy is known for its high strength, non-sparking, and low permeability. It is used in the manufacture of non-sparking tools like spanners, wrenches, and sockets. The alloy is also used in the manufacture of electrical components like switches and relays.



Photograph of the Non-sparking tool (Spanner) made of Cu-4.5Ti alloy

Properties of Cu-4.5Ti alloy are as follows:

- ❖ High strength (Tensile strength 898 MPa)
- ❖ Non-sparking material
- ❖ Low permeability (1.26×10^{-6} H/m)

The properties of Cu-4.5Ti alloy are given below

Tensile Properties and electrical conductivity of Cu-4.5Ti alloy

Sl. No	Property	Condition		
		ST	STAP	ST+CAV+P
1	Yield strength, MPa	440-500	700-730	1200-1280
2	Tensile strength, MPa	650-700	800-900	1250-1350
3	Elongation, %	20-35	15-25	1-5
4	Hardness, Hv	220-350	320-380	380-430
5	Electrical conductivity, % IACS	05-15	10-20	05-30

ST: Solution treated. STAP: Solution treated and Peaked.
ST+CAV+P: Solution treated and Peaked with Cold Worked.

It is used in the manufacture of non-sparking tools like spanners, wrenches, and sockets. It is also used in the manufacture of electrical components like switches and relays.

Non-sparking tool made of Cu-4.5Ti alloy is used in the maintenance of aircraft. The alloy is known for its high strength, non-sparking, and low permeability. It is used in the manufacture of non-sparking tools like spanners, wrenches, and sockets. The alloy is also used in the manufacture of electrical components like switches and relays.

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Thermal Insulating Ablative Liner, DMSRDE, Kanpur

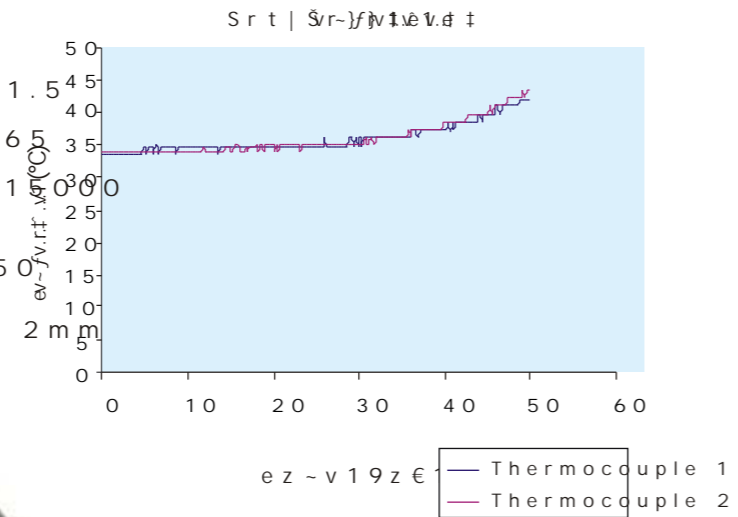
Since the use of ablative liners in jet engines, especially in the development of the ramjet engine, the material must have high thermal stability and high thermal conductivity.

The ablative liner is used in the form of a heat shield to protect the engine components from the high temperature of the combustion gases. The ablative liner is made of a material that can withstand the high temperature of the combustion gases and does not melt or burn.

Properties

1. Low viscosity
2. Thermal stability up to 1000 °C
3. Good adhesion to the substrate

Property	Value
1. Specific gravity	0.9 - 1.5
2. Shear Adhesion	45 - 65
3. Viscosity (uncured state), (mPa.s)	0.000 - 1.000
4. The back temperature in any case should not exceed 50 °C after 50 sec.	< 50



Ablative Liner after Oxy-acetylene flame test



Ablative Liner