Metal Filled Polymers & Conductive Adhesives

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STARTER PAPER:

Electrical and Thermal Conductivity of Polymers Filled with Metal Powders

- Ye.P. Mamunya, V.V. Davydenko, P. Pissis, E.V. Lebedev

WHAT ARE THEY?

WHAT ARE THEY?

- The term **polymer** sometimes refer to plastics, but also encompasses a large class comprising both natural and synthetic materials.

  Natural: *Shellac, amber, natural rubber and cellulose.*

  Synthetic: *Synthetic rubber, Bakelite, neoprene, nylon, PVC, polystyrene, polyethylene, polypropylene, polyacrylonitrile, PVB, silicone, & more.*

WHAT ARE THEY?

Metal Filled Polymer:

A polymer filled with metal particles such as Nickel, Copper, Graphite, Silver and more.

Conductive Adhesive: A type of metal filled polymer used primarily to repair or bind things to metal surfaces.

WHY USE THEM?

- The **mechanical** properties and **processing** methods are typical of plastics

- They are conductive **thermally** or **electrically**.

  Controlling these aspects allows for a range of applications.

RESOURCES:

Hy-Poxy: *http://www.hypoxy.com*

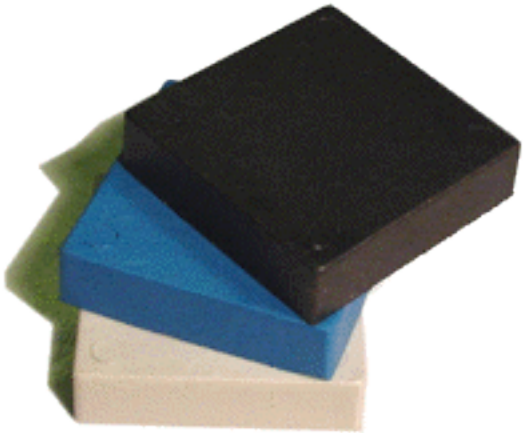
Ranging From $5.00 - $60.00

RESOURCES:

CoolPoly E-series:

Thermally & Electrically Conductive Plastics

http://www.coolpolymers.com/eseries.asp

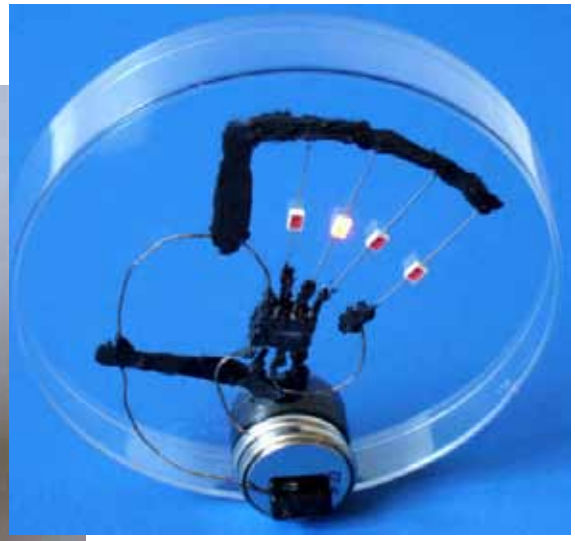


RESOURCES:

DYI Conductive Glue:

Using Carbon Graphite and Epoxy

http://www.instructables.com/id/Make-Conductive-Glue-and-Glue-a-Circuit/



RESOURCES:

Polysolder:

Screen printing, stencil printing or dispensing.

http://www.cooksonsemi.com/products/polymer/polysolder.asp

POLYSOLDER Conductive Adhesives

Paste Products	Description	Applications	Features & Benefits	Material Characteristics							
				Viscosity (kcps) (hours)	Pot Life @25°C	Cure Profile	Tg (°C)	CTE α_1 (ppm°C)	Volume Relativity (ohm-cm)	Thermal Conductivity (W/m°K)	Die Shear @25°C (PSI)
LT	Silver-filled electrically conductive paste	• Provides mechanical and electrical interconnect for surface mount components to substrate. • Stencil or dispense applications • EMI/RF grounding applications	• Pb-Free solder alternative • Low stress • No flux or post-soldering residues to clean • No alpha particle emission • Available as a 2 part system	150	8 hours	10 min @ 140°C	90	54	$\leq 5.0 \times 10^{-4}$	3.5	>2500 Au on Au
SE3001	Microdot dispensing silver-filled electrically conductive paste	• Provides mechanical and electrical interconnect for surface mount components to substrate. • Stencil or dispense applications • Microdot dispensing with 23 gauge needle • EMI/RF grounding applications	• Pb-Free solder alternative • Low stress • No flux or post-soldering residues to clean • No alpha particle emission	150-220	8-12 hours	15 min @ 130°C	90	54	$\leq 1.0 \times 10^{-4}$	4 to 5	≥2300 Au on Au

RESOURCES:

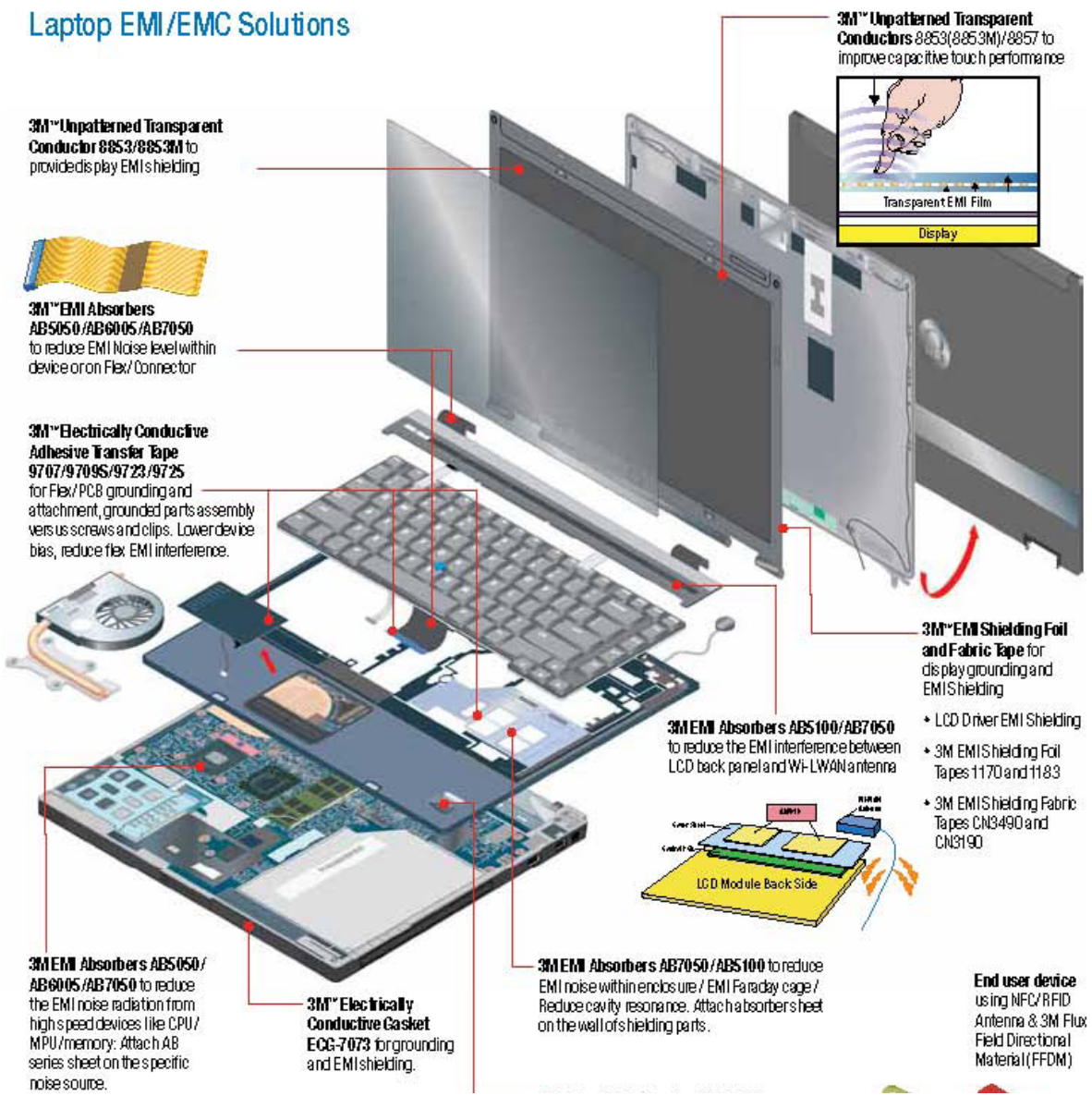
Cosmichrome™: a hybrid of paint and plating.
Coats anything - metals, ceramics, plastics, glass and even wood with a mirror like finish.

Ideal when:
electroplating and vacuum metallizing are unsuitable in cost, size, design, substrate material, or environmental issues.

Source: http://www.goldtouchinc.com/cosmichrome/index.html

RESOURCES:

Conductive Adhesive Tapes: http://www.staticfaction.com/products-tape.html



SAFETY PRECAUTIONS:

Plastic Steel:

- Moderate skin irritant.
- Contact at elevated temperatures can cause thermal burns which may result in permanent damage.
- May cause skin sensitization (itching, redness, rashes, hives, burning, swelling).
- Low vapor

SAFETY PRECAUTIONS:

Powders:

Proper ventilation to maintain a powder-air concentration well below the Minimum Explosion Concentration (M.E.C.) of the powder being sprayed.

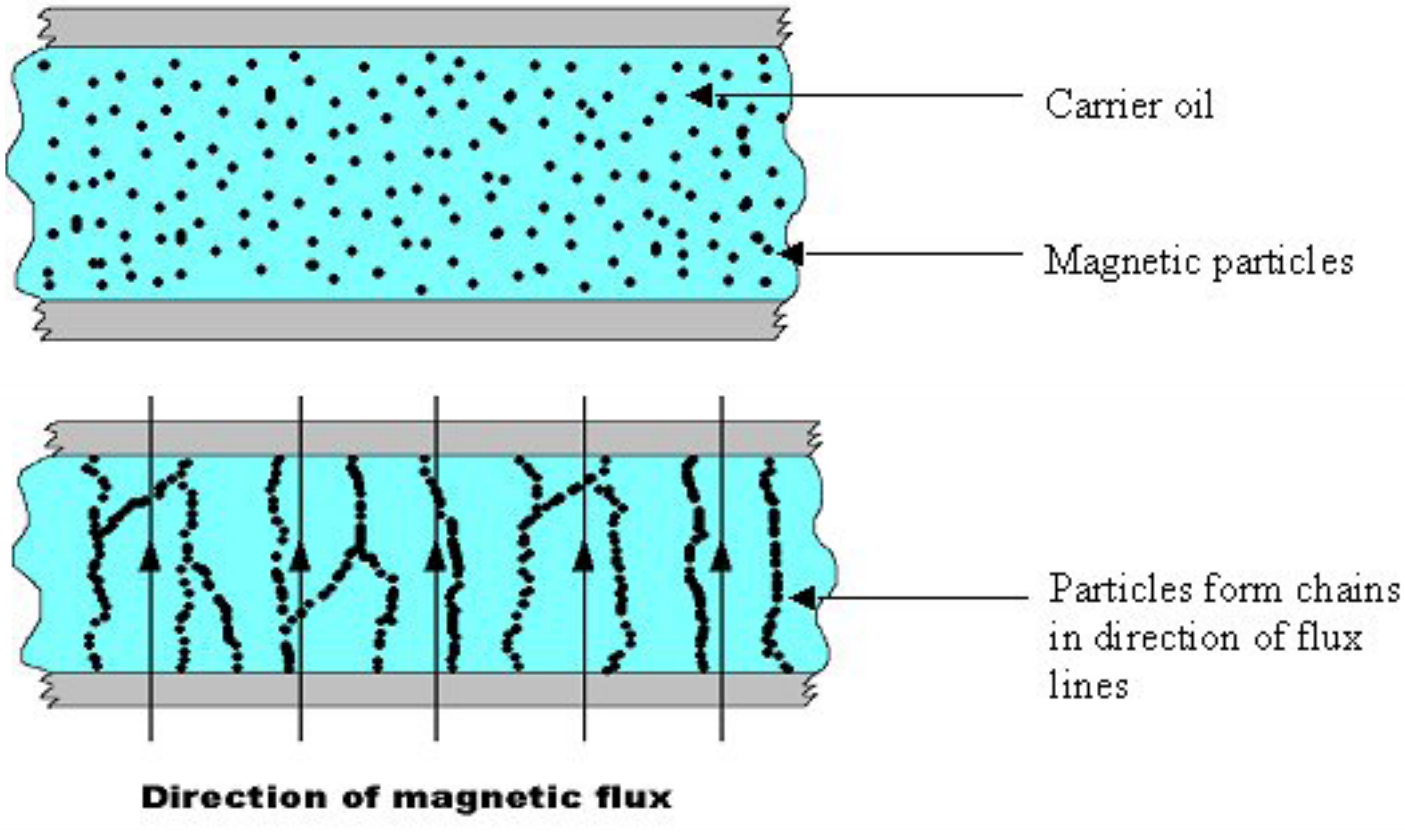
Care should be taken to avoid accumulations of dusts or powders in places where these accumulations could cause shorting of electrical switches, circuits or components

FUNCTION IN ART AND DESIGN:

Used in the Hubble Telescope.

MR Fluids: polymer-coated magnetic carbonyl iron microparticles in magnetorheological fluids

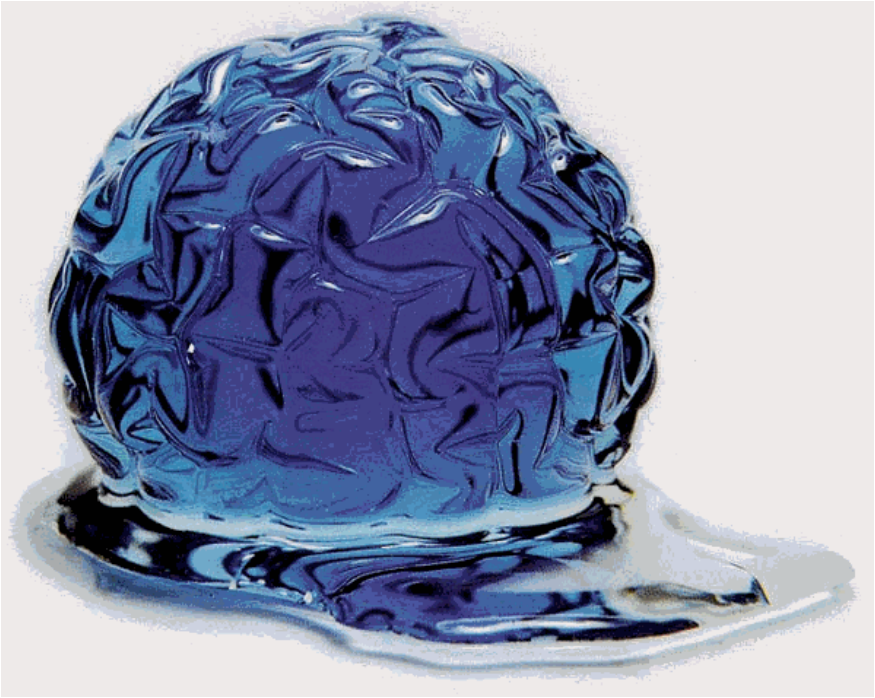
A smart fluid in a carrier fluid, usually an oil.
When subjected to a magnetic field, the fluid greatly increases viscosity.



FUNCTION IN ART AND DESIGN:

MR Fluids:

As Dampeners and Shock Absorbers



Possible use in military tanks as well as storm & earth-quake-proof bridges.

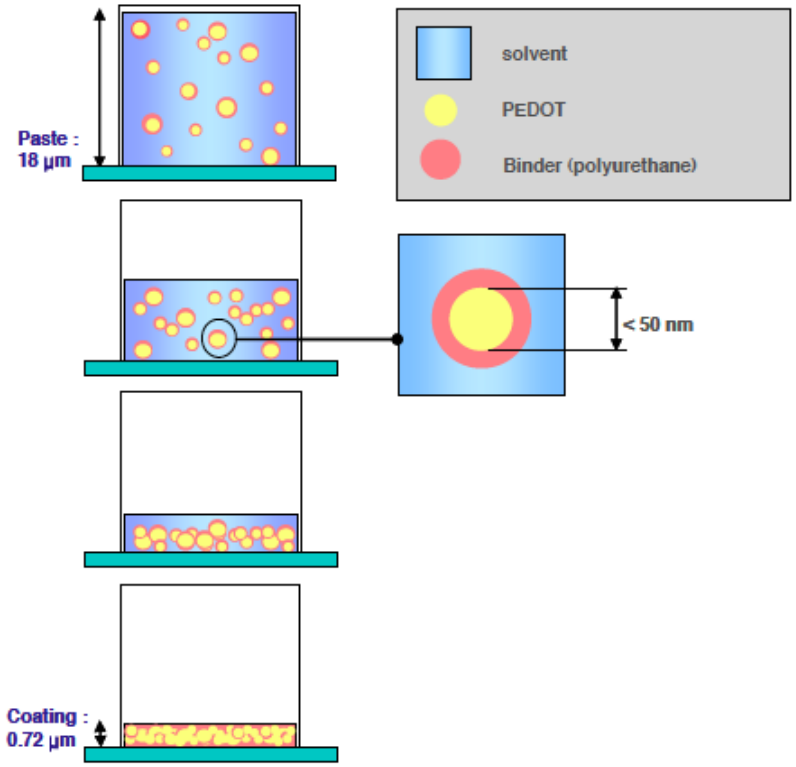
http://www.djc.com/news/ae/11151055.html

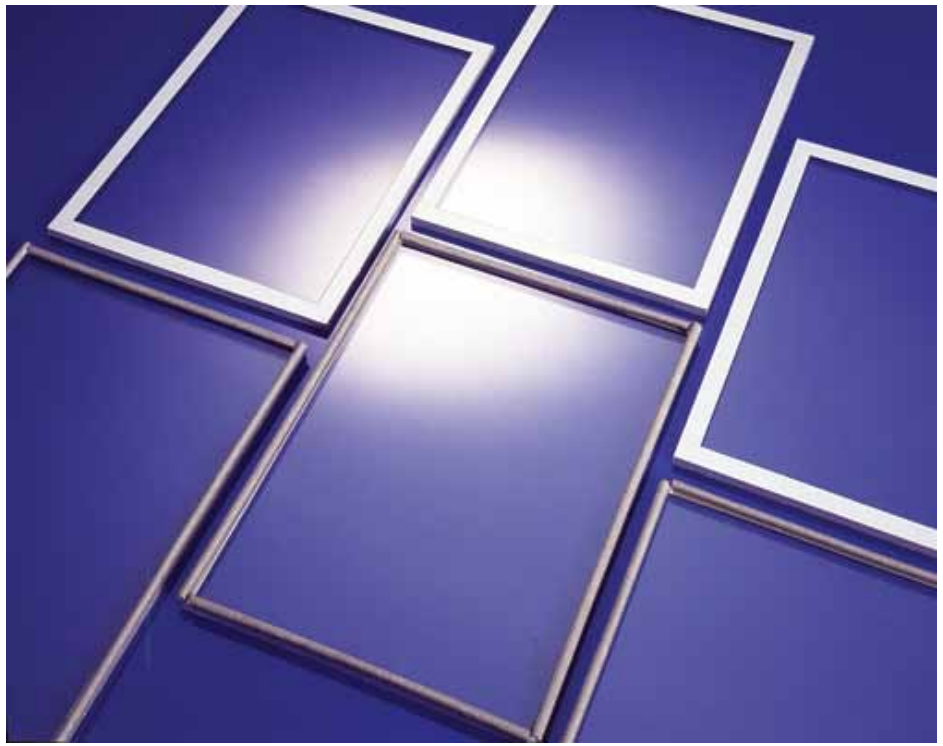
FUNCTION IN ART AND DESIGN:

EM Shielding:

The intrinsic conducting polymers which have wide range of electric conductivity could be adopted as EM wave absorbing material.

Harmful (EM) waves from mobile phone, portable music player, hair dryer, wireless devices.



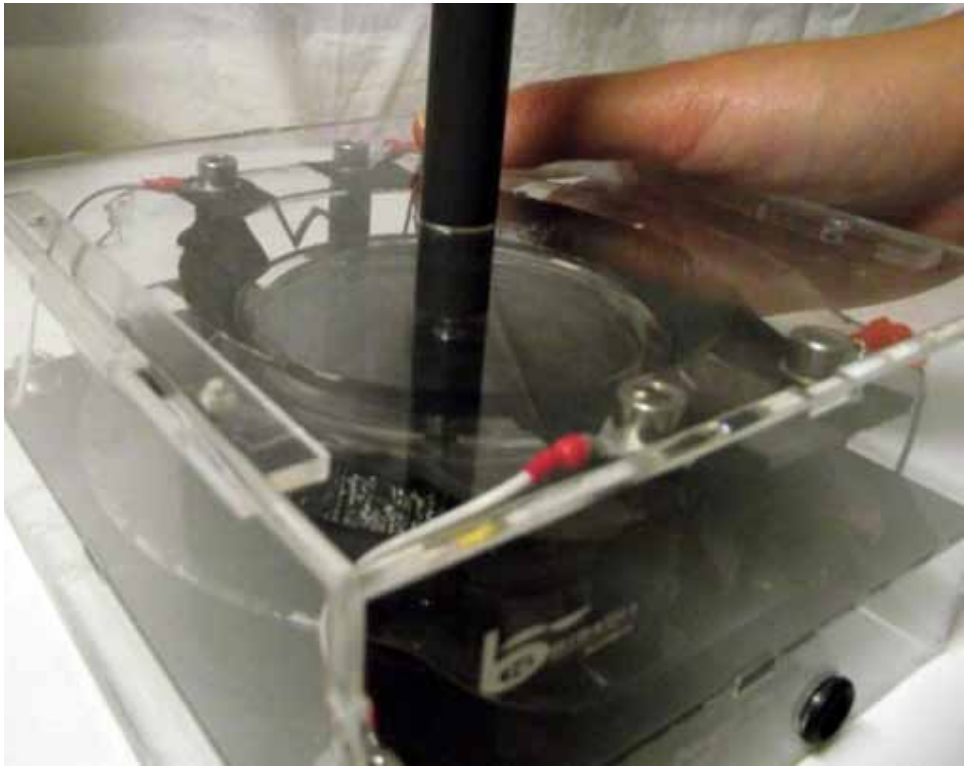


http://www.iccm-central.org/Proceedings/ICCM16proceedings/contents/pdf/ThuH/ThHM1-02ge_leewj225994p.pdf

FUNCTION IN ART AND DESIGN:

Flexible Generators:

Could Turn Shoes Into Rechargeable Batteries



http://www.ecouterre.com/flexible-generators-could-turn-shoes-into-rechargeable-batteries/

http://www.intechopen.com/source/pdfs/18330/InTech-Extending_applications_of_dielectric_elastomer_artificial_muscles_to_wireless_communication_systems.pdf

Artificial muscles, known as dielectric elastomer generators, are stretchy materials that produce energy when deformed.