Metal Filled Polymers & Conductive Adhesives
Electrical and Thermal Conductivity of Polymers Filled with Metal Powders

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WHAT ARE THEY?
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• 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
**RESOURCES:**

**Polysolder:**
Screen printing, stencil printing or dispensing.


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**POLYSOLDER Conductive Adhesives**

| Paste Products | Description                                      | Applications                                                                 | Features & Benefits                                                                                              | Material Characteristics | Die Shear
|----------------|--------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------
| 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 | Viscosity (cPs)  
Pot Life @ 25°C  
Cure Profile  
Tg (°C)  
CTE, ε<sub>33</sub> (ppm°C)  
Volume Relativity (ohm-cm)  
Thermal Conductivity (W/m°K)  
Die Shear @ 25°C (PSI) | >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 | Viscosity (cPs)  
Pot Life @ 25°C  
Cure Profile  
Tg (°C)  
CTE, ε<sub>33</sub> (ppm°C)  
Volume Relativity (ohm-cm)  
Thermal Conductivity (W/m°K)  
Die Shear @ 25°C (PSI) | >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:

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 & earthquake-proof bridges.

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.*

FUNCTION IN ART AND DESIGN:
Flexible Generators: Could Turn Shoes Into Rechargeable Batteries

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

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