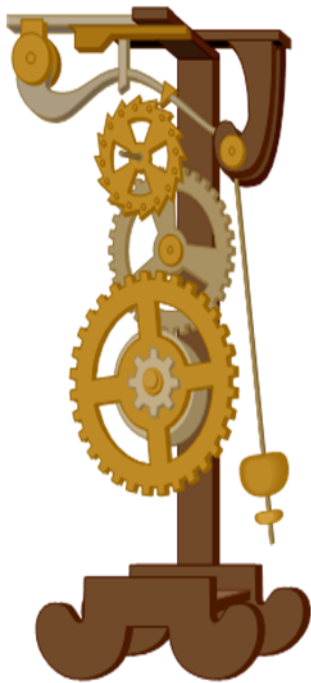


Pressure Sensitive Adhesive Tape Applications in The Automotive Industry

Mike Szymberski
Material Engineer
General Motors LLC
Warren, MI

Interior Adhesives



- Up to 1980's, interior adhesives, and processes completely controlled by OEM



- 1980's to 2005, interior adhesives, and processes selected by Tier to meet Performance specification.



- 2005 to present , control of some interior adhesives, and processes returning to OEM

INTERIOR ADHESIVES (cont.)

- Direct-coated pressure sensitive adhesives
- Adhesive transfer tapes
- Double-coated tapes
- Other adhesive types – hot melts, butyl rubber based, powder, heat activated films, and webs, liquids – thermoplastic, and thermoset
- Current substrates – ABS, PP, Nylon
- Future substrates – less ABS, more PP

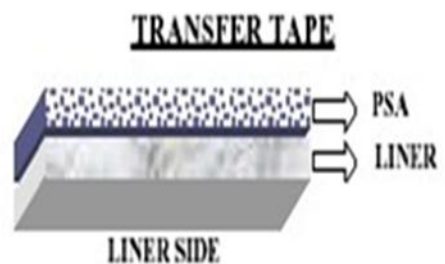
EXTERIOR ADHESIVES

- Exterior adhesives, and processes OEM controlled
- Direct coated PSA's
- Adhesive transfer films
- Double-coated tapes
- 1k, and 2k structural adhesives – urethanes, acrylics, and epoxies
- 1k silicone RTV's
- Current substrates – TPO, PP, ABS, PC, ASA, ASA-PC, ABS-PC
- Future substrates – more TPO

Pressure Sensitive Adhesive Tapes

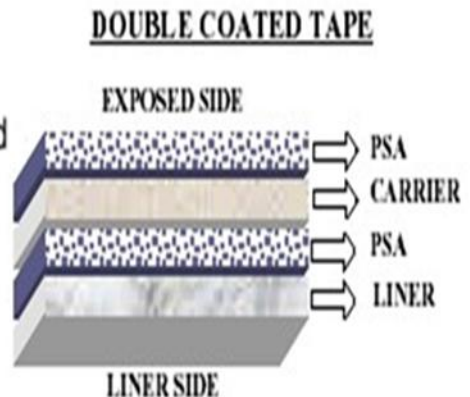
Adhesive Transfer Tape

Unsupported: There is no carrier. There is nothing to hold the adhesive together except for its own internal strength. Also known as 'Transfer' Tape. These are used for applications where you need flexibility and stretch and for bonding to irregular surfaces.



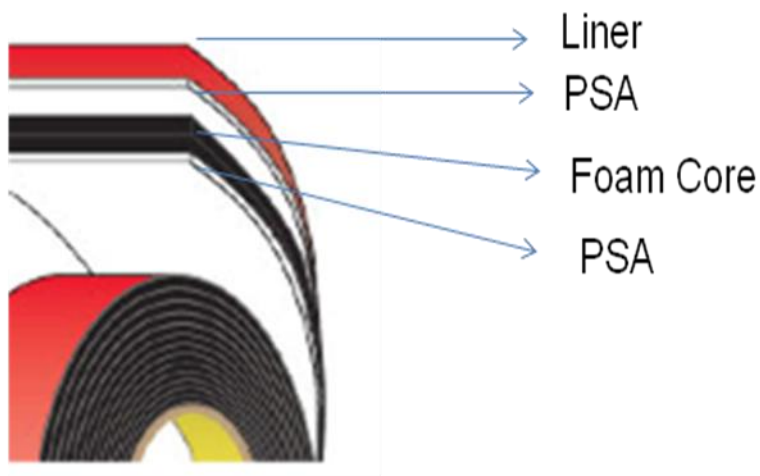
Double Coated Tape

Double Coated: PSA coated on both sides of a carrier protected by a release liner. Provides capability to put the same or different PSA on each side of carrier. Coating weight on each side of carrier can also be varied.



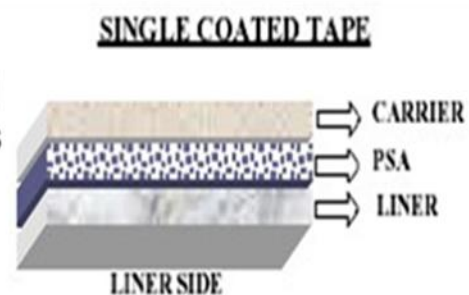
Pressure Sensitive Adhesive Tapes (cont.)

Double Coated Foam Tape

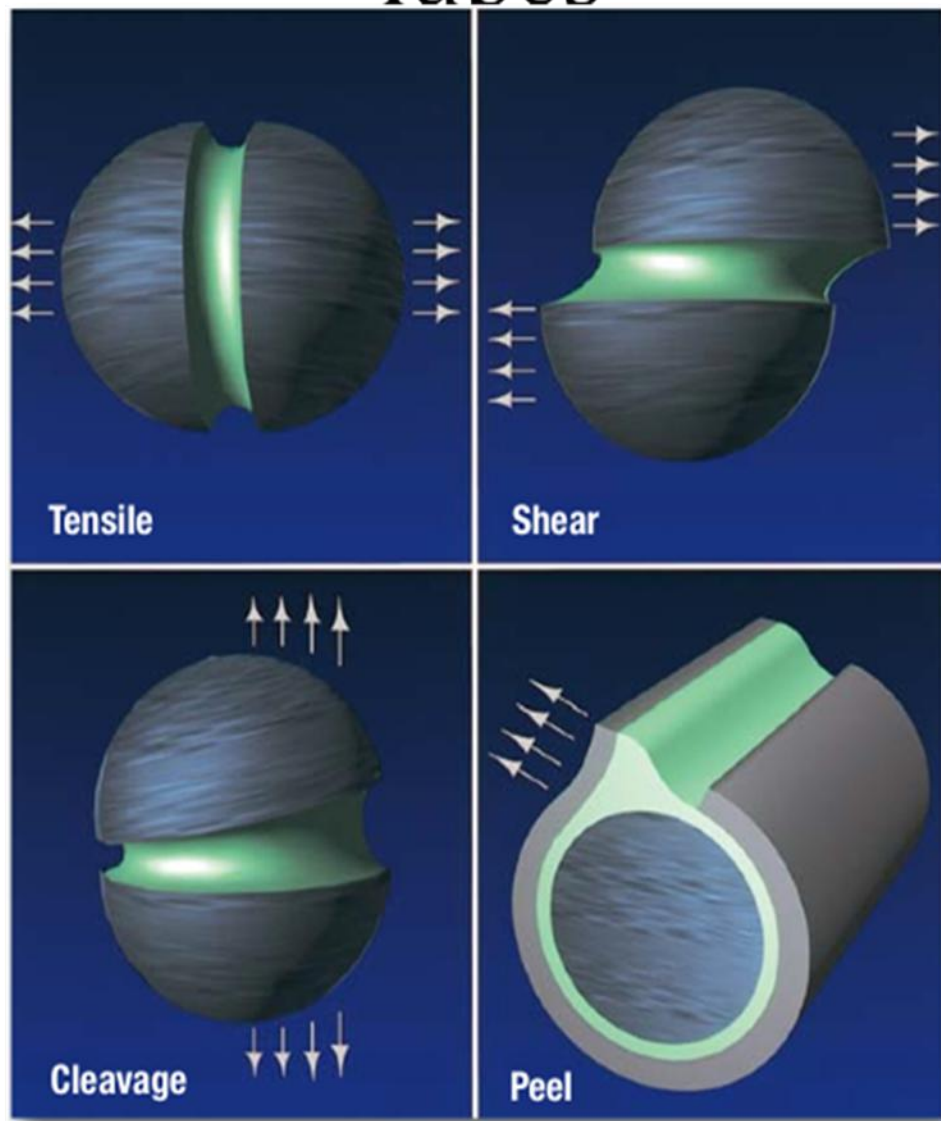


Single Coated Tape

Single Coated: PSA coated on one side of a flexible carrier and may be protected by a suitable release liner. Used where there is only one substrate to be bonded. It is also useful for wet laminating.

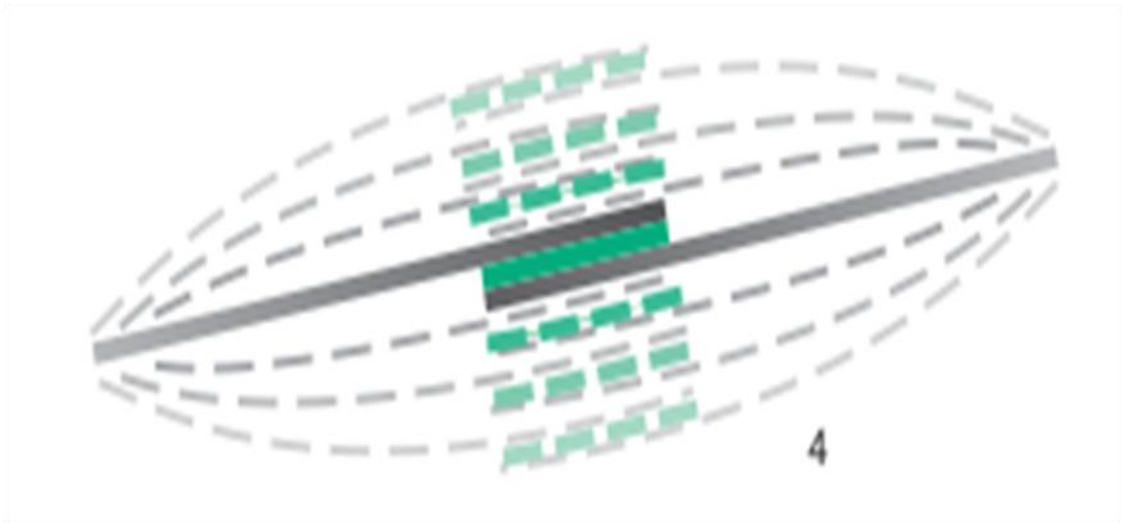


Pressure Sensitive Adhesive Tapes



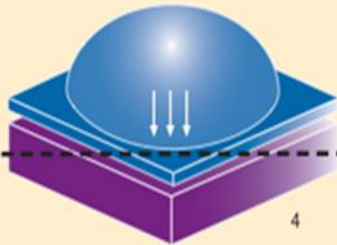
Pressure Sensitive Adhesive Tapes

- Vibration



HSE and LSE PLASTICS

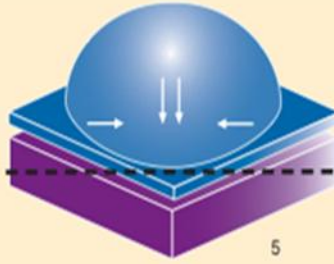
Metal Surfaces (High Surface Energy)



4

mJ/m ²	Surfaces
1103	Copper
840	Aluminum
753	Zinc
526	Tin
458	Lead
700-1100	Stainless Steel
250-500	Glass

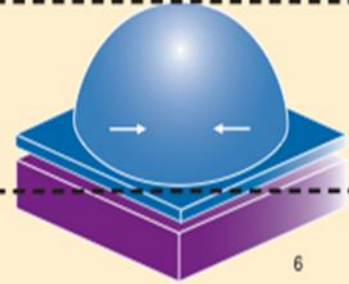
High Surface Energy Plastics (HSE)



5

mJ/m ²	Surfaces
50	Kapton® Industrial Film
47	Phenolic
46	Nylon
45	Alkyd Enamel
43	Polyester
43	Epoxy Paint
43	Polyurethane Paint
42	ABS
42	Polycarbonate
39	PVC Rigid
38	Noryl® Resin
38	Acrylic

Low Surface Energy Plastics (LSE)



6

mJ/m ²	Surfaces
37	PVA
36	Polystyrene
36	Acetal
33	EVA
31	Polyethylene
29	Polypropylene
28	Polyvinyl Fluoride Film
18	PTFE Fluoropolymer

APPLICATIONS

- Body side moldings
- Emblems and nameplates
- Exterior graphics
- Labels
- Foam gaskets
- Acoustic materials – absorbers, barriers, and dampeners
- Weatherstrips, and seals
- Stone protection films
- Solid rubber seals, and bumpers
- Sill plates
- Removable protective films
- Inner door water deflection film
- Harness wrap
- Thermal materials

- Roof ditch moldings
- Claddings
- Appliques
- Other miscellaneous applications

SUBSTRATES

- Exterior and interior paint
- High surface energy (HSE) plastics
- Low surface energy (LSE) plastics
- Elastomers
- Foams
- Glass
- Metals
- Acoustic materials – absorbers, barriers, vibration dampeners
- Solid Rubber

SUBSTRATES, GLASS - LIKE

- Glass, ceramic, stone, other siliceous material
- Hydrophilic (water loving)
- Water, humidity undercuts the bond
- Need silane coupling agent

SUBSTRATES, POROUS

- Open surface not well suited for tape bonding
- Require sealing to provide a unified surface
- Apply coating
- Apply liquid adhesive

SUBSTRATES, METALS (uncoated)

- Uncoated metals prone to oxidation, and weakening of the bond
- Iron, aluminum, magnesium, copper, brass, bronze
- Apply coating

SUBSTRATES, (that contain plasticizers)

- Flexible PVC contains plasticizers
- Some rubber compounds (e.g. EPDM, neoprene) can contain plasticizers, and oils
- Plasticizers, and oils can migrate into the tape, and affect adhesion
- Use plasticizer resistant adhesive
- Apply adhesion promoter/plasticizer barrier

EXTERIOR PAINT

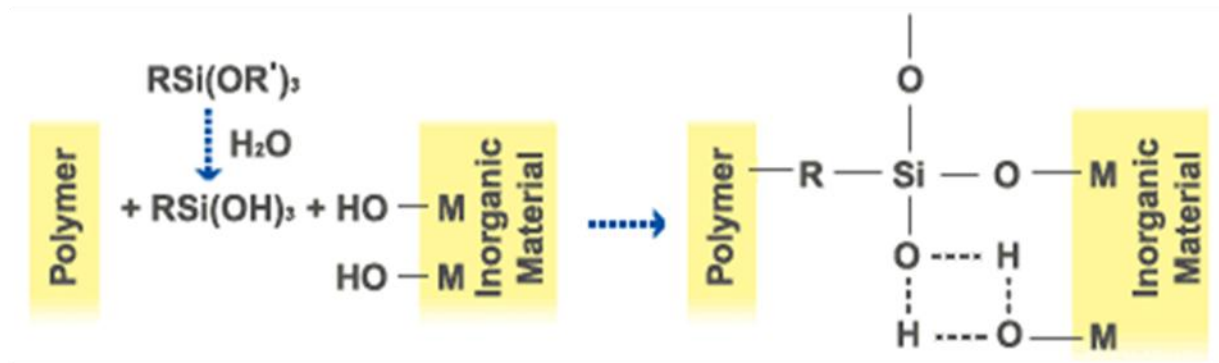
- Up to 80's - solution, and dispersion lacquers
- 80's and beyond – high solids enamels, and base coat/clear coats.
- Recently - etch resistant base coat/clear coats
- Chemistries – acrylic/silane, 2k urethanes, 1k acid/epoxy, and 1k carbamate
- 1k carbamate (urethane/epoxy hybrid) most difficult to bond
- Future – more difficult to bond 1k's, ceramic based (?)

ELASTOMERS

- Past – nitrile, neoprene, EPDM (ethylene, propylene, diene monomer)
- Future – less EPDM, more Santoprene and TPV's
- EPDM – thermoset
- Santoprene and TPV's – thermoplastic matrix – polypropylene continuous phase with dispersed phase of EPDM particles

SILANE COUPLING AGENTS AND ADHESION PROMOTERS

SILANE COUPLING AGENTS



ADHESION PROMOTERS

