Bonding Guide [DRAFT, working]

Updated 4/25/2025

Background	*This guide narrows the materials to the most common prototyping materials in multidisciplinary engineering projects.*
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Video Link:	August 2024, How to Choose an Adhesive, Youtube
Began	##########

Table 1: Materials

Recommended adhesive based on pair of materials.

		Polymers					Organic			Metal		
		P	P	P	P	P	O	O	O	M	M	M
		ABS	ABS (FS)	Nylon	HDPE	PVC	Rubber	Wood	Wood (FS)	Aluminum	Copper	Steel
P	ABS	PVC Glue	PVC glue	Hot glue	Hot glue	CA glue	Hot glue	Hot glue	silicone	silicone	silicone	silicone
P	ABS (FS)		Superglue Gel	Hot glue	Hot glue	CA glue	Hot glue	Hot glue	CA glue	silicone	silicone	silicone
P	Nylon			Hot glue	Hot glue	CA glue	Hot glue	Hot glue	Hot Glue	Hot glue	Hot glue	Hot glue
P	HDPE				Hot glue	CA glue	Hot glue	Hot glue		Hot glue	Hot glue	Hot glue
P	PVC					CA glue	X	Hot glue				
O	Rubber						CA glue					
O	Wood						Wood glue	Wood Glue		silicone	silicone	silicone
O	Wood (FS)							wood glue		silicone	silicone	silicone
M	Aluminum									silicone	silicone	silicone
M	Aluminum (FS)									epoxy	epoxy	epoxy
M	Copper										solder	silicone
M	Steel											silicone
M												

Required conditions

Conditions expected for the materials listed above:

Gaps	contact with gaps <0.5mm
Flatness	both items are flat, not wavy
Polymer surface	must be sanded - 80 grit paper (rough)
wood surface	
aluminum surface	
steel surface	
painted metal	

Key	Description	example
FS	Flat and smooth	HDPE sheets as-supplied from store
R1	Rough, 1	sanded with 120 grit sandpaper
R2	Rough, 2	sanded with 80 grit sandpaper
S1	Smooth, 1	sanded to 240 grit sandpaper
S2	Smooth, 2	sanded to 400 grit sandpaper

Difficult to Bond

Material	description
Flexible PVC	Waterproof liners, ie shower liner, a flexible sheet, labeled as PVC but similar to vinyl
HDPE	
Nylon	
Vinyl Sheet	often peels away easily from most adhesives when cured. very chemical resistant.
Clear vinyl	(needs testing)

Adhesive	fill gaps	remain flexible	Seal & re-use
PVC Glue	☆ 2	☆ 1	★ 3
Hot Glue	☆ 2	☆ 2	★ 3
Superglue	☆ 1	☆ 1	★ 3
Silicone	☆ 2	★ 3	☆ 2
Expanding foam	★ 3	☆ 2	☆ 2
Wood glue	☆ 1	☆ 1	★ 3
contact cement	☆ 1	☆ 2	☆ 2
Urethane	★ 3	★ 3	☆ 1

Most workable Materials:	
Geometry	Material
Custom shape	ABS
Flat Panel	Expanded PVC
Flat Panel	FOAM

My Ratings for Adhesive Selection

Updated ~2024

Category	Definition
Bond Strength	strength on MOST suitable material, compared with the material itself
Flexibility	Value 5 is silicone and value 1 is concrete
Rigidity	Value 1 is concrete and value 5 is silicone

If there's a 5 for both bond strength and material strength, you can make a joint as strong as the materials

Adhesive	Bond Strength (best)	Flexibility (1mm)	Rigidity (1mm)	Material Strength
silicone	4	5	1	3
hot glue	4	3	3	3
wood glue	5	2	4	5
E600	4	5	1	
JB Weld	5	1	5	4
Bondo	4	2	4	5
PVC Cement	5	2	4	
solder, 63/37	4	2	4	

Strength comparison

Material	Strength(PSI)	Tensile (Mpa)
epoxy resin (for fiberglass)	6,000	41.4
jb weld	5,000	34.5
ABS plastic	8,000	55.2
Solder, 63/37	7,000	48.3

Materials Temperatures

Updated *8/12/2024*
By *David Malawey*
Source *Makeitfrom.com and google gemini*

	Material	Temperature (deg C)
Working Temp	hot glue stick	150
	melt solder (37% Pb)	190
	burn leather	200
	melt nylon	220
	melt ABS	220
	lead-free solder	220
	burn wood	320
Safe Temp	Rubber Tire	110
	FR-4 (circuit board)	150
	Carbon Fiber w/Resin	150
	silicone tube	230
	fiberglass	260