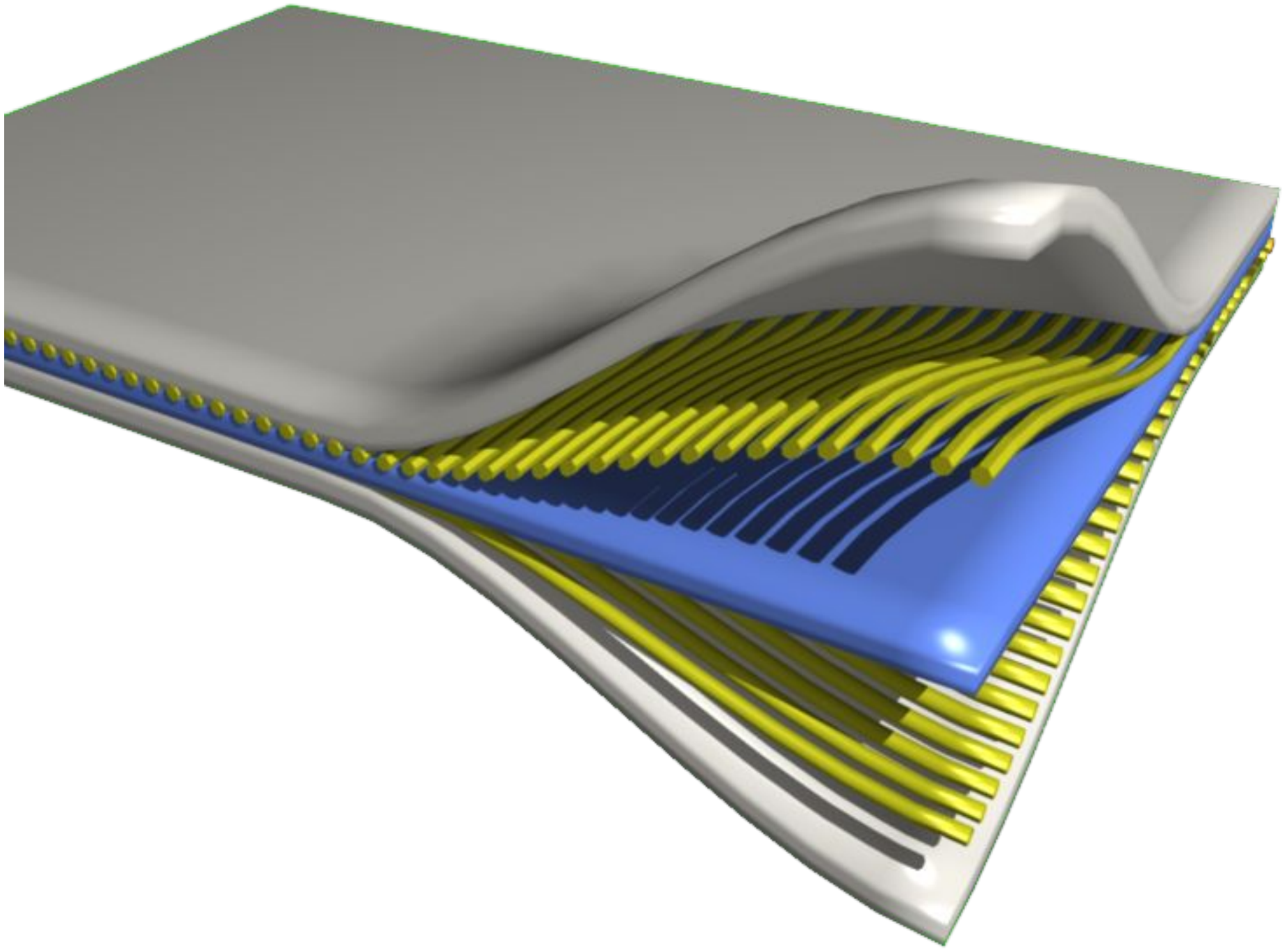
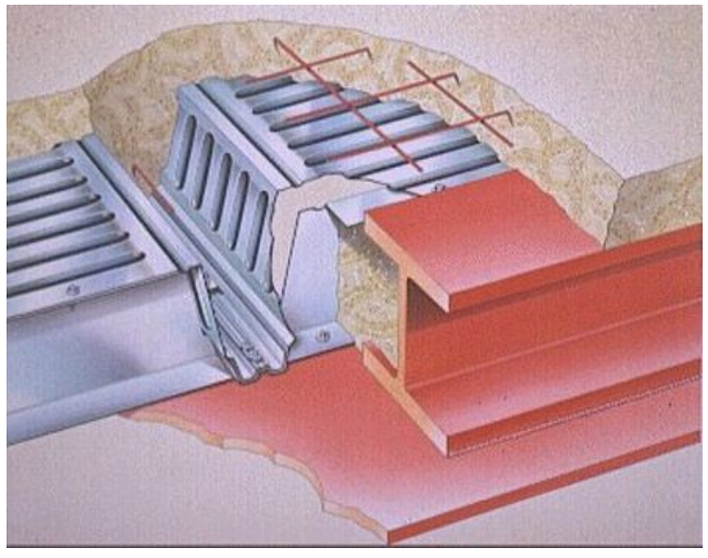
123 Composites

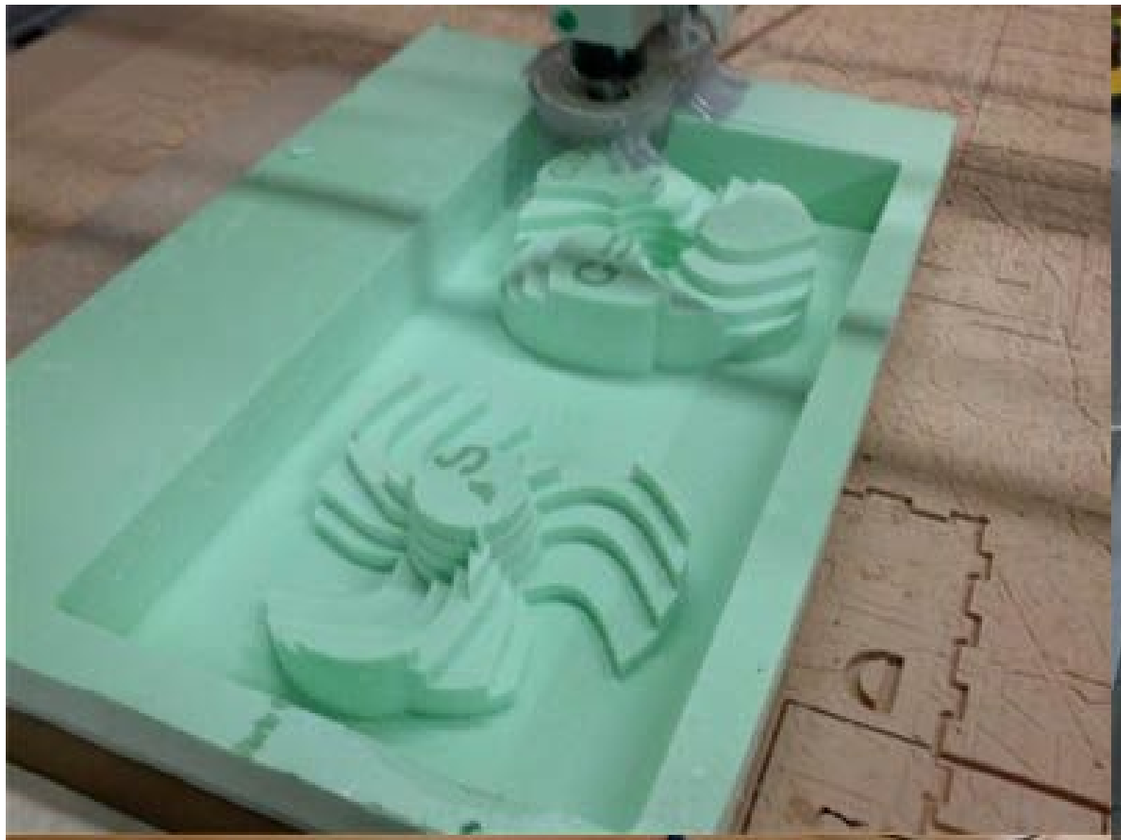
A composite material (also called a composition material or shortened to composite) is a material made from **two or more constituent materials** with significantly different physical or chemical properties that, **when combined, produce a material with characteristics different** from the individual components.

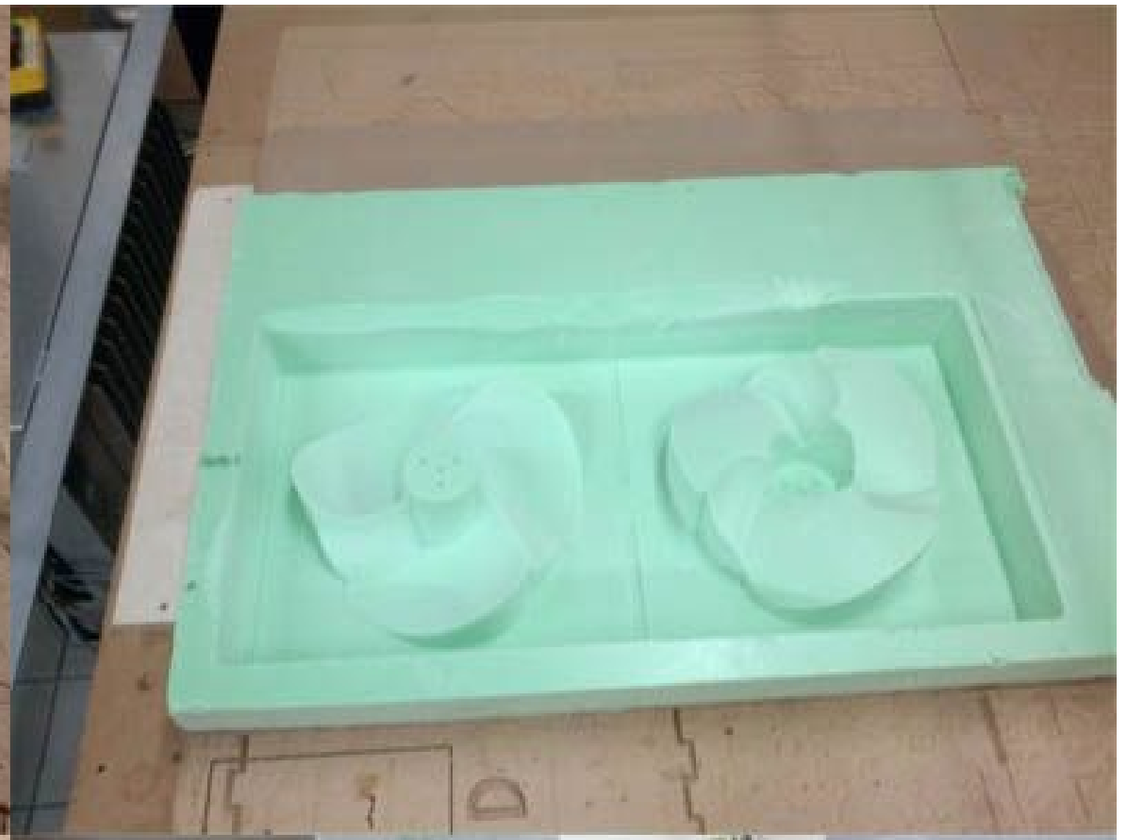


Uses



Molds





GELCOATING

Resin

SUPER SAP ONE

Fiberglass composites
Natural fiber composites
Woodworking
Epoxy coatings
Fiberglass boat repair
Adhesives and sealants
Surfboards, standup paddleboards and handplanes

Mix Ratio (by volume) 2:1

Pot Life (100g) 25 mins

Recommend Full Cure

7 days

SUPER SAP CLR

Fiberglass composites
Carbon fiber composites
Natural fiber composites
Clear Coatings
Fiberglass boat repair
Adhesives and sealants
Surfboards, paddleboards, handplanes

Fast Cure: 25 min pot life, 4 HR tack free time
Slow Cure: 40 min pot life, 8 HR tack free time

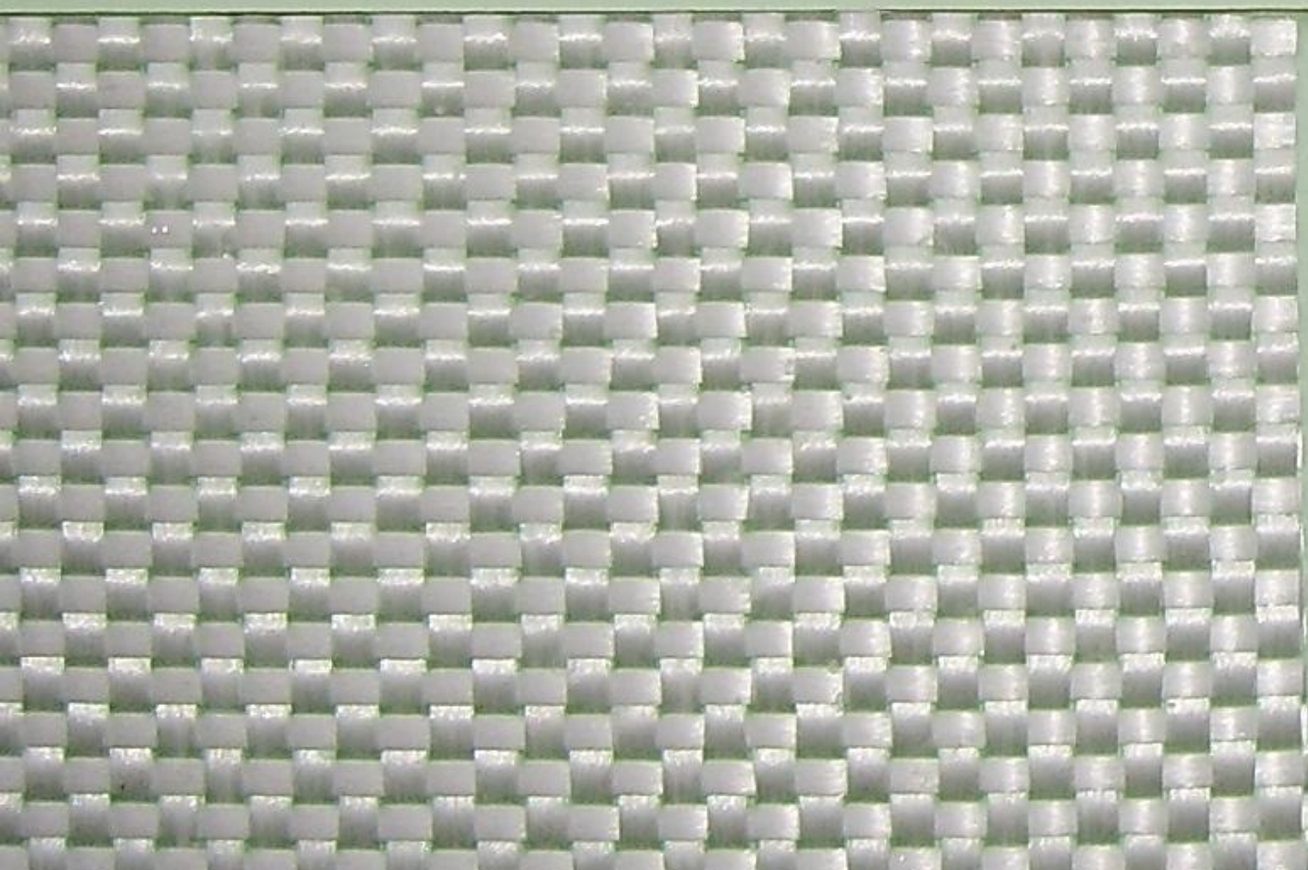
Mix Ratio (by volume) 2:1

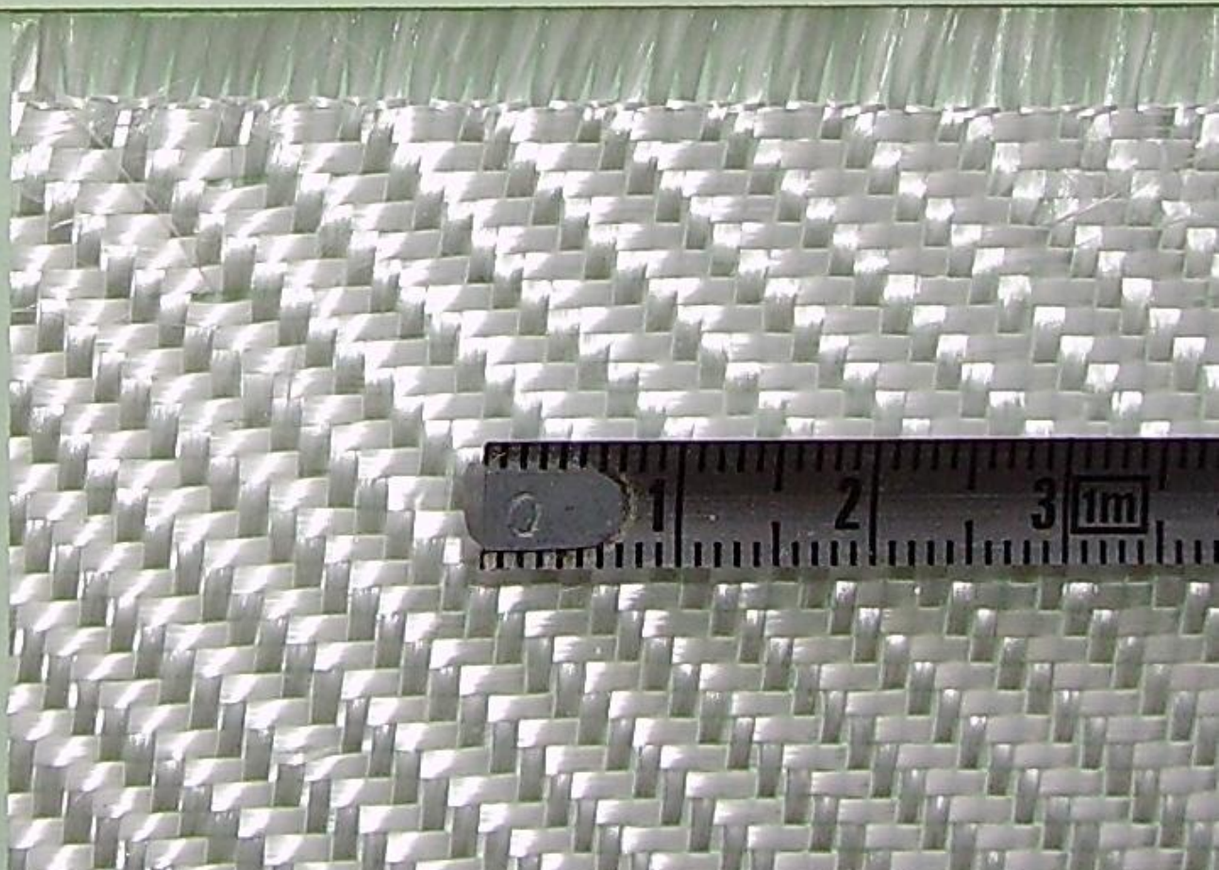
Mixing

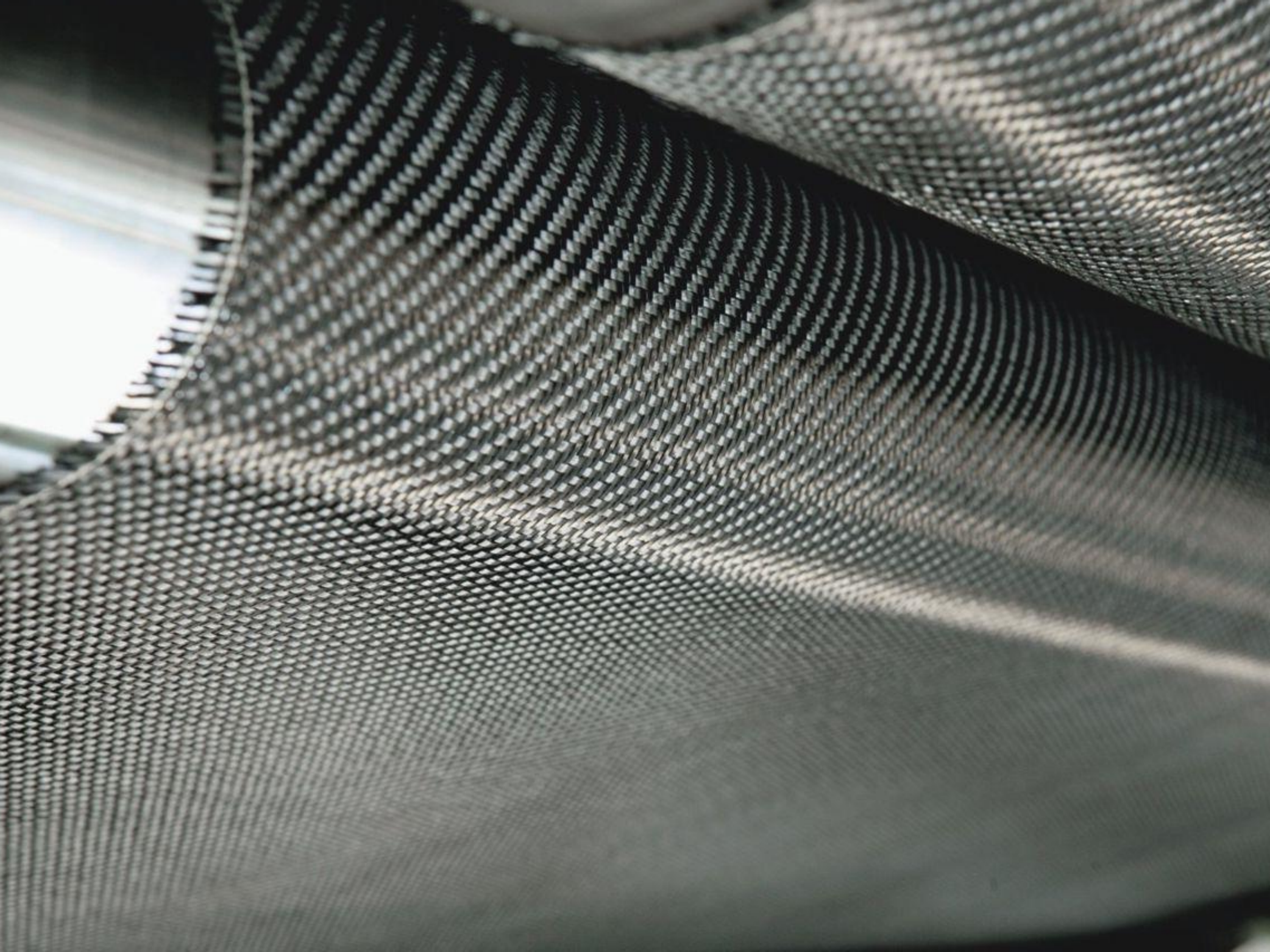

SUPER SAP CLR EPOXY
SUPER SAP CLF HARDENER
EPOXY
RESIN
PART A
HARDENER
PART B
SUPER SAP 2 PART EPOXY SYSTEMS
02:18

Degassing Epoxy

Materials



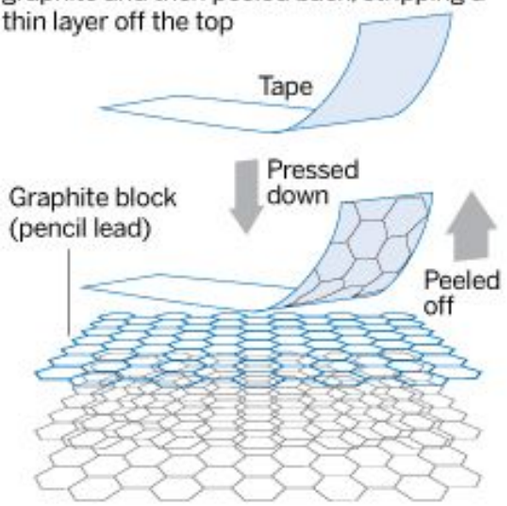

0
1
2
3
1m



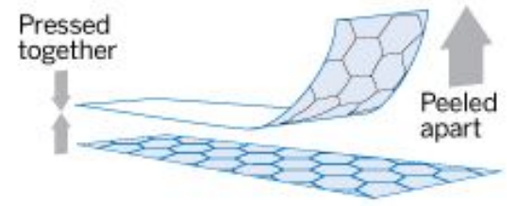
Five recipes for graphene

Mechanical exfoliation

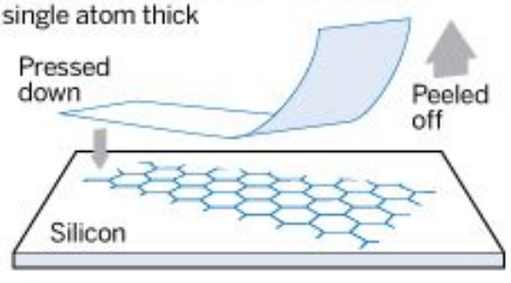
1 A sticky 'tape' is placed on to a block of graphite and then peeled back, stripping a thin layer off the top



2 This layer of carbon is thinned further by pressing it on to other layers of tape



3 The tape is finally pressed on to a very smooth substrate such as silicon then peeled off, leaving a graphene layer a single atom thick



Sample size

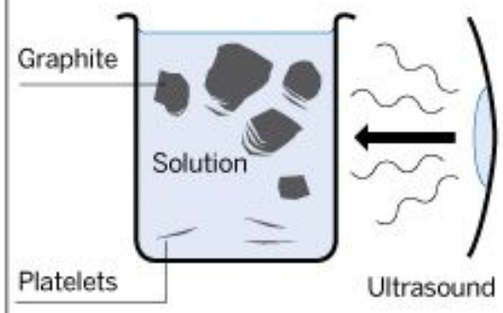
Greater than 1mm

Applications

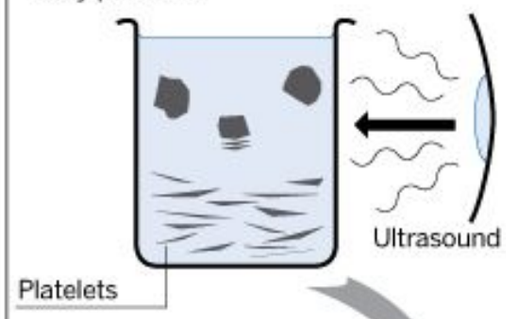
Research

Chemical exfoliation

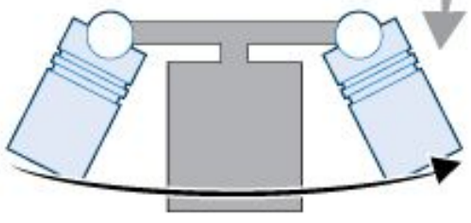
1 Graphite is exposed to a solvent which with the aid of ultrasound causes it to split into individual mono-layer flakes or platelets



2 Prolonged treatment leads to many platelets



3 These mono-layers of graphene can be further enriched by centrifuge



Sample size

Infinite as a layer of overlapping flakes

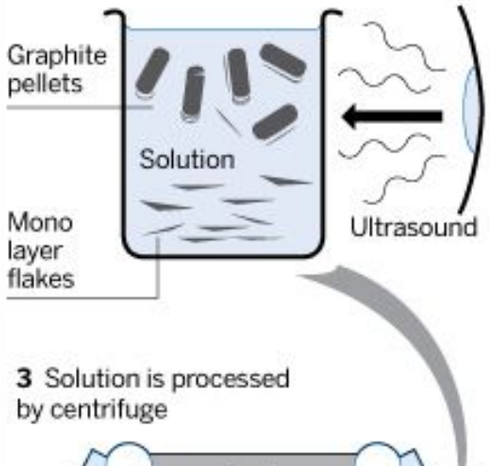
Applications

Coating, paint, ink, composites, transparent conductive layer energy storage and bioapplications

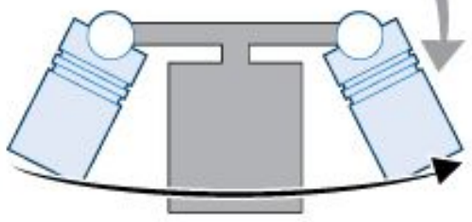
Chemical exfoliation via graphene oxide

1 Related to chemical exfoliation but graphite pellets are first oxidised

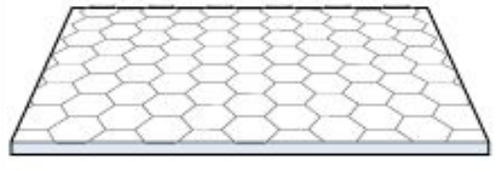
2 Pellets exfoliated in chemical solution to produce mono-layers of graphene



3 Solution is processed by centrifuge



4 Solution is deposited on to a substrate and reduced (chemically or thermally) to parent graphene state



Sample size

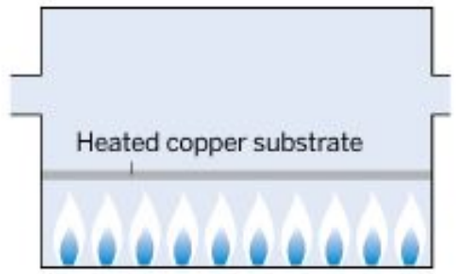
Infinite but with larger flake size than simple chemical exfoliation

Applications

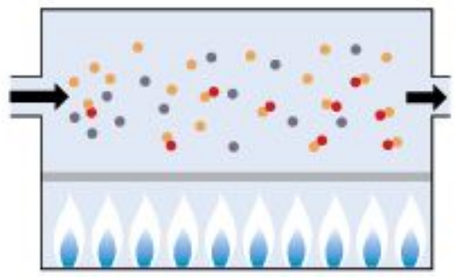
The same as chemical exfoliation

Chemical vapour deposition

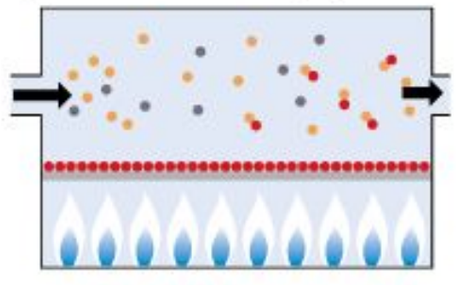
1 A substrate (usually copper) is heated in a furnace at low pressure to about 1,000°C. This anneals the copper



2 Methane and hydrogen gases flow through the furnace



3 Carbon atoms from the methane are deposited on to the copper. They crystallise as a continous graphene sheet



Sample size

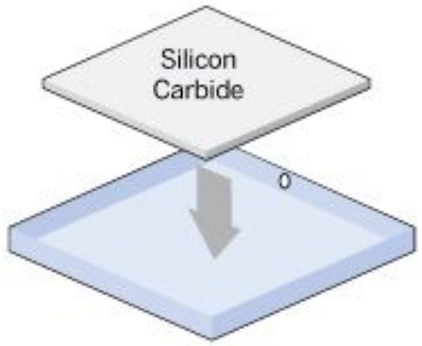
About 1m

Applications

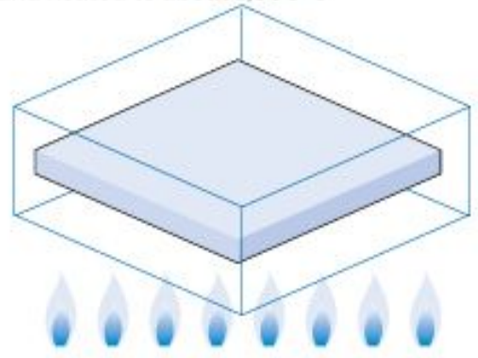
Photonics, nanoelectronics, transparent conductive layer sensors and bioapplications

Silicon carbide

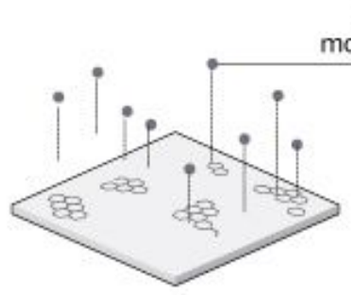
1 A small amount of silicon carbide (about 10mm x 10mm) is placed in a box with a small hole in it



2 The box is sealed in a vacuum or argon and heated to about 1,500°C



3 Silicon molecules 'evaporate' from the surface, leaving a high quality layer of graphene



Sample size

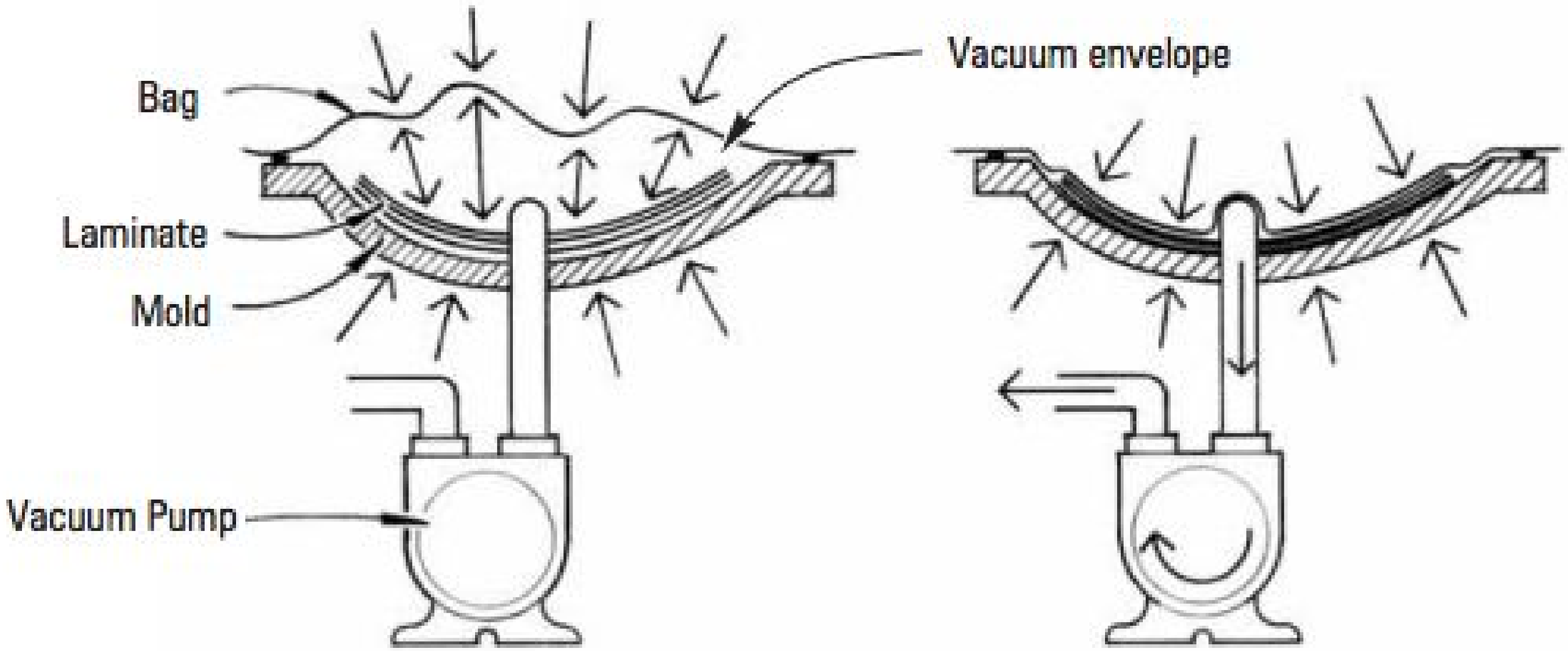
About 100mm

Applications

Transistors and other electrical devices

Sources: Benjamin Pollard, Department of Physics, Pomona College; Nature; Review Research; Electronics Weekly

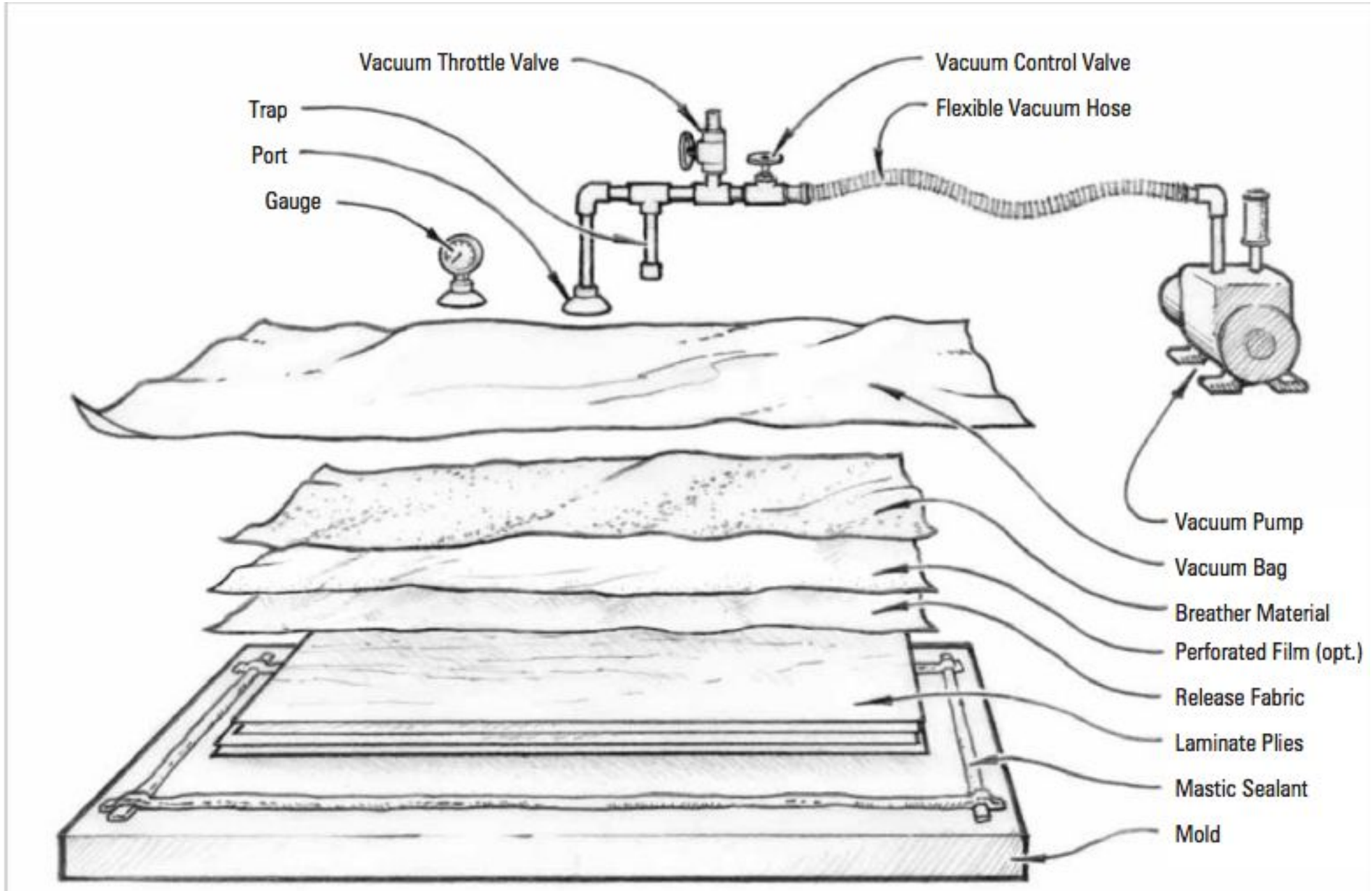
Laminating



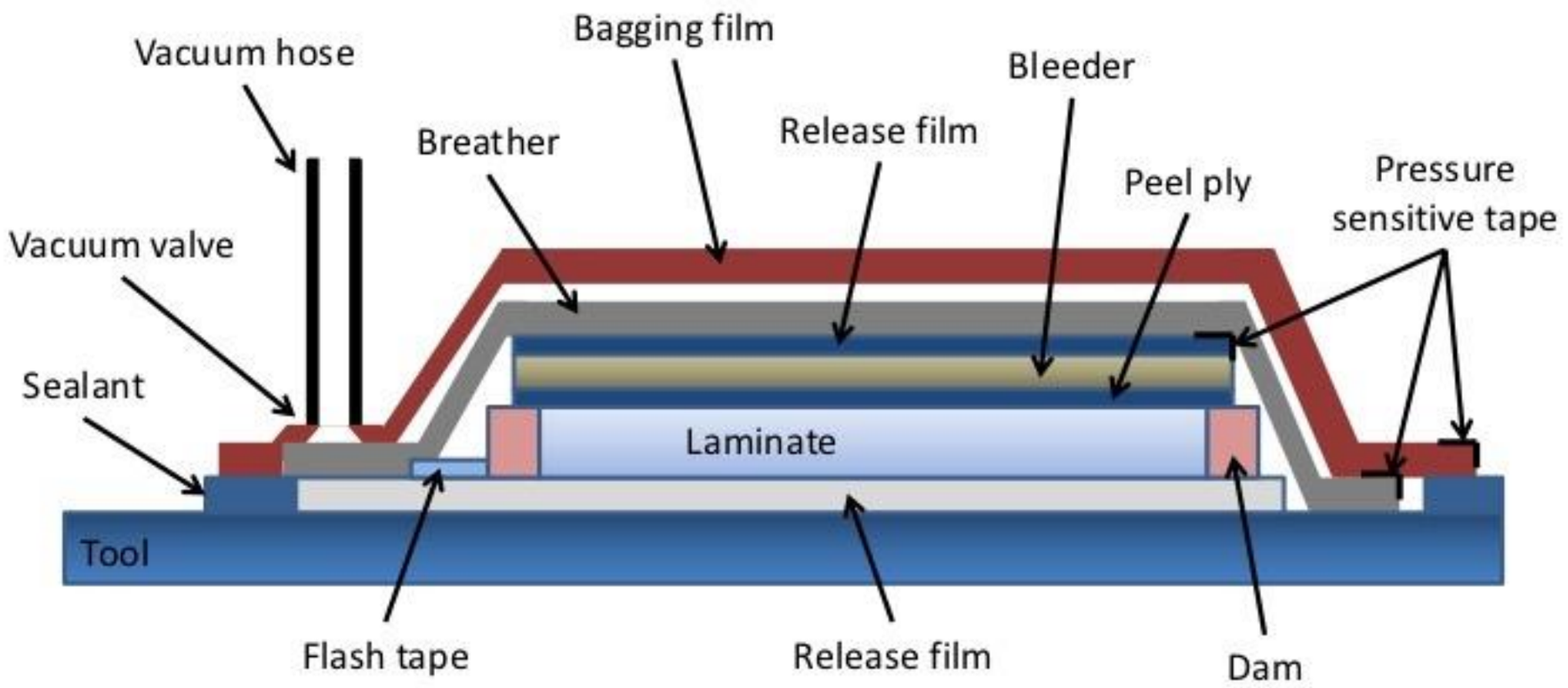
Atmospheric pressure = 14.7 psi
Envelope pressure = 14.7 psi
Pressure differential = 0

Atmospheric pressure = 14.7 psi
Envelope pressure = 6 psi
Pressure differential (clamping pressure) = 8.7 psi

Vacuum Bagging



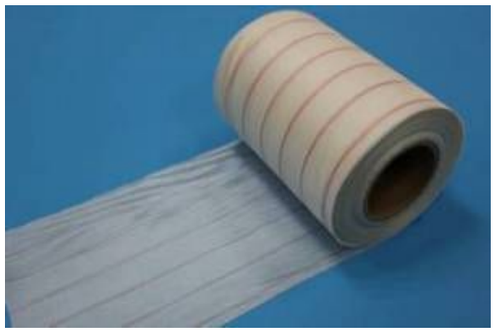
Vacuum bagging



The vacuum bagging technique can be used to improve the quality of composites produced by the wet lay-up method. A bagging film is placed around the laid-up composite material and is secured to the tool surface with sealant. Air is evacuated from the bag, leaving the composite under an external pressure of up to 1 atmosphere. This forces resin into any remaining voids and helps to ensure an even distribution. Higher viscosity resins can be used in comparison to the wet lay-up technique.

Bagging Materials

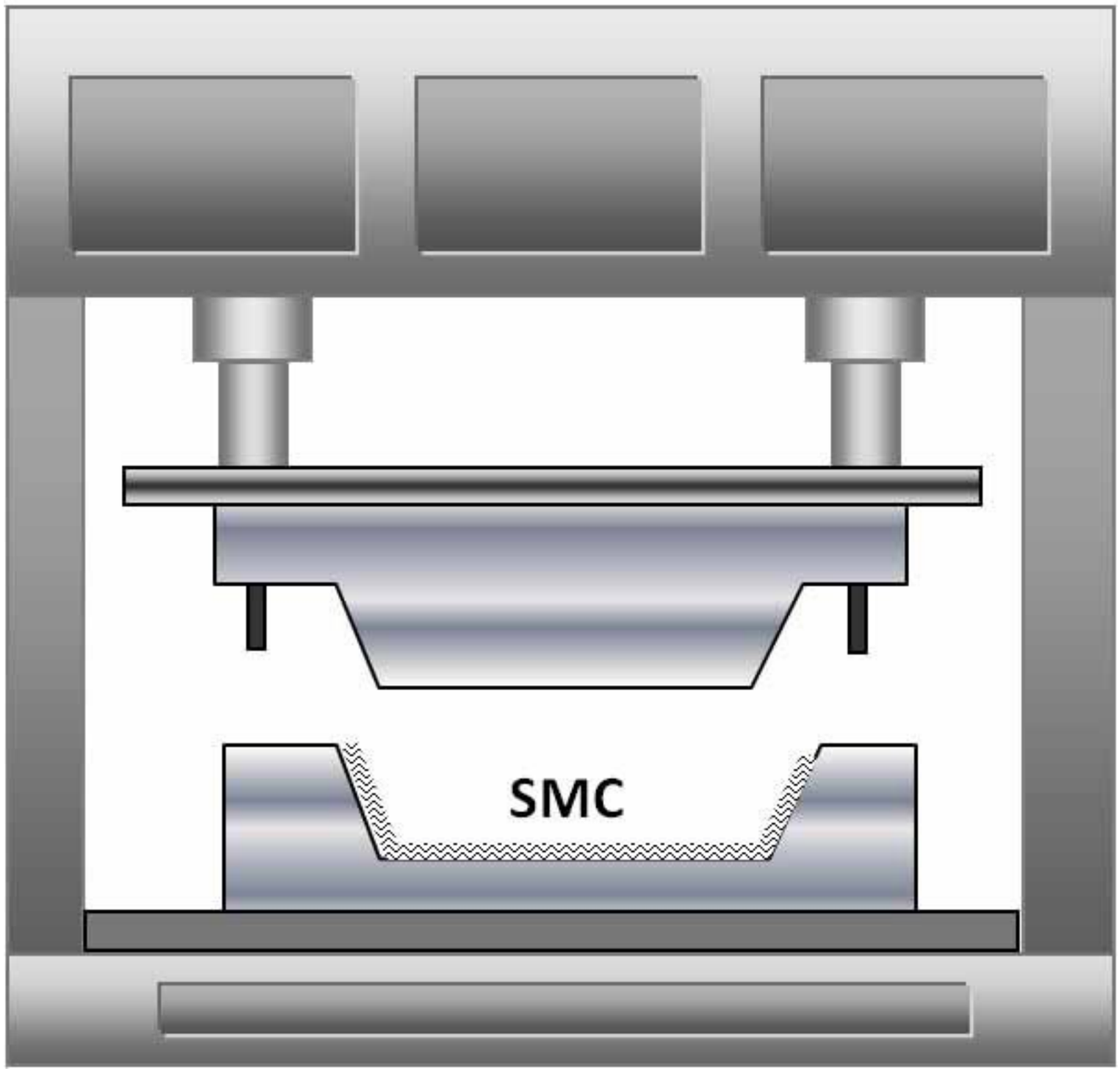
- Release fabric
- Perforated film
- Breather material
- Vacuum bag
- Mastic sealant



Mold release

- 5 layers carnauba wax plus
- PVA spray

Compression Molding



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