

A look for Primitive environment Potting Compound for electronics

Wax

Tar

Silicon rubber

Oil

Grease

Hot melt glue

Epoxy

Hot melt glue

On Feb 5, 9:53 am, nospam <nos...@xxxxxxxxxxxxxxxx> wrote:
I'm quite keen on using hot melt glue for sticking and encapsulating electronic things and thought I would do an experiment.

I took a 10M metal film resistor, cut the leads short and soldered a bit of ordinary PVC hook up wire to each.

I then coated the resistor, joints, and a bit of the wire with hot melt glue. Just generic semi-transparent hot melt stick.

I took a jam jar and poked two holes in the lid, threaded the wires through and sealed each side of the lid with more hot melt glue.

I half filled the jam jar with a saturated solution of table salt and stuck the lid on with the resistor submerged. The resistor measured 10.123M at the time.

The jam jar has been sat on a window ledge getting daylight and a little direct sun light for the last 23 months. I gave it an occasional shake.

It hasn't leaked, the lid seal is intact. The hot melt glue seemed to decompose a little. It seems thin layers from the surface detached and are floating in the solution. The lid has gone rusty so the solution is brown with a bit of brown scummy decomposed or detached hot melt floating it.

The resistor measures 10.087M today (and probably a bit more if it were warmer here).

I am pretty impressed. The glue has kept the solution off the resistor and the seal between glue and hook up wire has held up as has the seal in the lid.

Glue / Gum Animal glues include hide glues, casein or milk protein glues, and fish-based glues. Hide glues are produced by hydrolysis or by boiling collagen, protein, or gelatin from animal bones, hide, hooves, or horns. Collagen, hide glue, and gelatin are very closely related in terms of protein and chemical composition. Casein-based adhesives (carpenter's glues) are derived from milk. Vegetable glues are made from plant-based proteins or modified starches. Soy protein glues are finding increased application.

Gum adhesives or mucilage are based on polysaccharides derived from various plant exudates such as an oleoresin or gum resin. Gum adhesives are gelatinous when moist and harden after drying. Gum adhesives are the salts of complex organic acids.

Mucilage contains proteins and polysaccharides and is similar to vegetable plant gums adhesives. Mucilage is a gelatinous substance extracted from legumes and seaweeds

<http://www.vintage-radio.net/forum/showthread.php?t=37381>

13th Feb 2009, 01:28 PM	#1
GrimJosef Pentode Join Date: Sep 2007 Location: South Oxfordshire Posts: 149	Pitch for potting transformers Some vintage transformers and chokes, including the ones used in Quad II amps, were either coated with or even potted in pitch - the familiar black tarry substance. I have a few transformers which have lost some of this and I'd like to replace it. If you like, I want my parts to "look the part" 😊 Can anyone tell me if there's anything special about transformer pitch as opposed, say, to the sort they use on flat roofs (which might perhaps melt at a higher temperature ?). Are there any tricks for pouring it over the transformers, or into their cans in the case of potting ? Do you know of a source of supply ? Cheers, GJ

[GrimJosef](#)
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13th Feb 2009, 07:26 PM	#2
kalee20 Hexode Join Date: Feb 2007 Location: Lynton, N. Devon Posts: 406	Re: Pitch for potting transformers Well, I've not potted or enveloped a transformer in pitch. But, I'd suggest that pitch for the transformer industry may have been 'special', as opposed to just any old pitch from the roofing industry - maybe extra refining to remove any acid content etc. Pitch does flow even at room temperatures, as it's really an extremely high viscosity liquid (there's an experiment somewhere that has pitch running through a funnel - rate

is 1 drop per 30 years I seem to remember). So, if potting a transformer, be sure that it is generally kept upright, especially when powered (and hence warm).

Pitch does have the advantage that it is slightly compliant and can absorb thermal expansion and contraction of whatever it's encapsulating. Though, it is also prone to cracking at low temperatures.

Before you go looking for pitch, make sure your transformer really is a pitch one - some epoxy potting compounds look just the same. It's easy to tell, because the epoxy won't melt with a soldering iron whereas pitch will.

For the coating, assuming you have a transformer already coated in (chipped) pitch, I'd bake it in an oven for some hours (over a drip tray) at just over 100 deg C, to dry out any moisture which may have seeped in through cracks and allow the (dirty?) surface layers to run off. Then, I'd immerse the hot unit in molten pitch, remove, and allow to cool. When the outside starts to solidify, I'd then give it a quick dip, allow to cool, etc until you've increased the thickness to what you want - like building up a candle. Doing this will allow each new layer to adhere to the previous layer. On the other hand, if it's potted in a metal box, it's just a question of putting the baked (and still hot) transformer back in its potting box, filling with pitch, and allowing to cool.

Bear in mind that hot pitch is flammable - you should be prepared with a CO2 extinguisher handy!



kalee20

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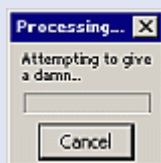
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13th Feb 2009, 07:51 PM

#3

[Sean Williams](#)

Moderator



Join Date: Feb 2005

Re: Pitch for potting transformers

I would use synthetic potting compound if you are thinking quad 2 transformers - Molten pitch is a bad thing - too hot and you have a serious fire on your hands.

Sean

Happiness is a cherry red anode 🍒

Are you a member of the [YCHJCYA2PDTHFH](#) club?

Location: St.Ippolyts,
Hitchin, Hertfordshire QRA
IO91UW
Posts: 2,105



Sean Williams

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13th Feb 2009, 07:52 PM

#4

[Oldtimer74](#)

Pentode

Join Date: Apr 2008
Location: Worcester
Posts: 184

Re: Pitch for potting transformers

I would agree. It needs to be refined to remove any acid and prevent damage to the component. I would definitely not use roofing pitch. In any case these days it may not be pitch but some modern chemical substitute which has better properties for that job. Similar remarks apply to the wax coating of components. The wax has to be highly refined for the same reason. Neither can be refined at home. Sorry I don't know where you can buy either. I did get some wax many years ago from a manufacturer of high voltage equipment through a personal contact. I keep any pitch I can from faulty components of a reputable manufacturer.

Pat G3IKR



Oldtimer74

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14th Feb 2009, 10:41 AM

#5

[GeorgSc](#)

Tetrode

Join Date: Dec 2008
Location: Germany
Palatinate
Posts: 62

Re: Pitch for potting transformers

Pitch is the black residue when heating pine rosin (=colophonium) or from pine tar distillation. The distinction between rosin and pitch was often not precise. I doubt that there is any production of pitch today, because beer kegs are not made from wood any more.

The black residue from coal tar formerly, today from crude oil

distillation is named **bitumen**.

It is used for streets, roofing and so on, there are different qualities with respect to softening temperature.

Which grade of bitumen was used to fill transformers or capacitors,
I don't know. I would not do it, because it is a messy work,
and because it might come out on warming of the transformer.

All other drawbacks mentioned above are wrong, there never was a kind of "purification" of bitumen with respect to acid or similar.

The only processing is to heat the vacuum residue of certain crudes to 300°C for up to 3 days, while air bubbles percolate the hot bitumen.

This very brute treatment removes the last traces of volatiles and oxidizes/hardenes the bitumen. (The acid content will rise!)

The degree of this treatment, and sometimes some natural asphalt (e.g. from trinidad) blended to it, makes the bitumen "grades".

Wax:

Very problematic word! There is bees wax, some dozen sorts of earth waxes, paraffin wax, and a hand full of synthetical waxes (ethylene with some acrylic acid polymerized).

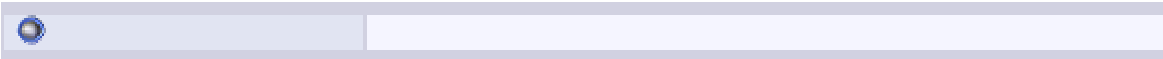
I guess here paraffin wax was meant. Again all ideas about grades of different purity are wrong. The kind of process to isolate it in petroleum refineries makes it pure anyway.

Depending on the origin of the crude, the paraffin wax can be a little bit softer or harder, that is all.

Concerning its use as a isolator, the wax from any (except beeswax) candle is o.k.

Due to a tendency to have crackles within the wax on solidifying, wax is not as good as mineral oil as a high voltage isolator.

Regards
Georg



GeorgSc
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16th Feb 2009, 12:27 PM #6

[Oldtimer74](#)
Pentode
Join Date: Apr 2008
Location: Worcester
Posts: 184


Re: Pitch for potting transformers

I think we shall have to agree to differ.
Pat



Oldtimer74
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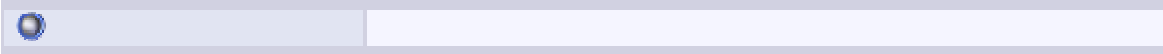
16th Feb 2009, 01:01 PM #7

[Tim](#)
Octode

Join Date: Jan 2003
Location: Bradford on Avon, Wiltshire.
Posts: 1,548

Re: Pitch for potting transformers

Black silicone sealant? Will dry to a black gloss.....

"Nothing is as dangerous as being too modern; one is apt to grow old fashioned quite suddenly."



Tim
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16th Feb 2009, 01:10 PM #8

[AlanBeckett](#)
Tetrode
Join Date: Dec 2008
Location: Burton upon Trent
Posts: 68

Re: Pitch for potting transformers

Back in the '60s, when I worked for a TV manufacturer, we vacuum impregnated transformers in (pale) wax. It was done in a couple of large autoclaves in batches. We used to slip foreigners in with the production batches. The LOPTs on the other hand were coated/dipped in black wax. Unfortunately I haven't a clue what was actually used. All I can say is that they

both melted at a fairly low temperature. I remember one of the workers splashing the black variety on to her hands and it didn't do much damage. Of course, in those days, 'Elf and Safety' wasn't so rampant!
Alan



AlanBeckett

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16th Feb 2009, 02:29 PM

#9

[HG MICKE](#)

Tetrode

Join Date: Jul 2007

Location: London

Posts: 59



Re: Pitch for potting transformers

The wax that I use for potting or re potting Audio transformers is Microcrystalline wax, This has a higher melting point than Paraffin wax.

The advantage of wax against epoxy potting compounds is that it can easily be removed if any problem arises, Silicone should not be used as it contains acetic acid and has shown to eat through copper.

Colin



HG MICKE

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16th Feb 2009, 03:30 PM

#10

[kalee20](#)

Hexode

Join Date: Feb 2007

Location: Lynton, N. Devon

Posts: 406



Re: Pitch for potting transformers

Wax for impregnating transformers is definitely not like candle wax, it is soft yet melts at a high temperature. I have seen the stuff in slab form.

As for silicones, Colin Hg Micke is partly right. Some types of single-component RTV silicone rubber do emit acetic acid during curing (bath sealant type stuff - smelling vinegary). Others cure by emitting water vapour (neutral curing grades). For electronic use, the acetoxycure stuff is bad news, but the neutral grades are fine (and adhere very well to clean surfaces). And, there are also 2-component silicone rubber compounds, which polymerise with no vapours produced at all. But, they don't adhere particularly well so may not be good for repairing chips. Have a look at the Dow Corning web site.



kalee20

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16th Feb 2009, 03:37 PM

#11

[Tim](#)

Octode



Join Date: Jan 2003
Location: Bradford on Avon, Wiltshire.
Posts: 1,548

 **Re: Pitch for potting transformers**

Quote:

but the neutral grades are fine (and adhere very well to clean surfaces)

Which I should have made clear. Once again I had to rush off!

"Nothing is as dangerous as being too modern; one is apt to grow old fashioned quite suddenly."



Tim

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17th Feb 2009, 11:59 PM

#12

[GrimJosef](#)

Pentode

Join Date: Sep 2007
Location: South Oxfordshire
Posts: 149

 **Re: Pitch for potting transformers**

Thanks for all the replies folks. I do know that there are modern replacements for pitch (epoxies, silicones etc) and also that wax has been an alternative for years. But I'm undertaking a restoration job so I want to use (as near as I can) the original stuff. If I replaced it with something better that would be an upgrade, not a restoration.

Incidentally I am sure it's pitch (or bitumen, or tar - I recognise that there are differences between these but they're subtle as far as I'm concerned). It has that very distinctive "hot tar" smell when it melts.

I've had a further rummage on the internet and, of course, I discovered that there was a British Standard for it. BS1858 - 1973, entitled "Bitumen-based filling compounds for electrical purposes" (there's a newer version, dated 2002, but that restricts itself to the insulation of cables). The 1973 standard discusses solubility, softening point, penetration, viscosity, pouring point, electric strength, flash point, mineral matter, acidity, "injurious sulphur", adhesion and contraction. So it sounds as though the stuff is (or at least was) pretty tightly specified and the chances of getting hold of it in small

quantities are looking slim 😊

In this case I still think my best chance might be to check out roofing pitch. Provided I don't get the synthetic stuff I think it'll be the closest thing to the original material. And it will be diluted (I imagine by at least 10 to 1) by the stuff that I recover. So with luck the acidity will not have a big effect. Furthermore the roofing stuff can't be too corrosive or it would attack the nails which hold the roofing boards down. If I'm really worried I might dip the transformer itself in pure original bitumen and build up as thick a layer of this as possible before fitting it back into the can and filling the remaining space with the mixture of old and new.

Wish me luck !

Cheers,

GJ



GrimJosef

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18th Feb 2009, 09:35 AM

#13

[dominicbeesley](#)

Heptode



Join Date: Nov 2004
Location: Hebden Bridge
Posts: 625

Re: Pitch for potting transformers

Is pitch still poored into the junctions boxes used in under-road electrical distribution wiring? (I must admit the only book I have on the subject must be at least 60 years out of date!)

Dom



dominicbeesley

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18th Feb 2009, 09:49 AM

#14

[kalee20](#)


Hexode

Join Date: Feb 2007
Location: Lynton, N. Devon

Re: Pitch for potting transformers

Quote:

Posts: 406

Originally Posted by **GrimJosef** 
Wish me luck !

Good luck GJ!

kalee20

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18th Feb 2009, 12:20 PM

#15

[GeorgSc](#)

Tetrode

Join Date: Dec 2008

Location: Germany

Palatinate

Posts: 62

 **Re: Pitch for potting transformers**

Quote:

Incidentally I am sure it's pitch (or bitumen, or tar - I recognise that there are differences between these but they're subtle as far as I'm concerned). It has that very distinctive "hot tar" smell when it melts.

If You

would have to drink beer stored in casks coated inside with bitumen

instead of pitch, You would not think the difference is "subtle" : =)

Silicone "bath" sealants:

There are three curing types:

- acid, splitting off acetic acid
- neutral, splitting off ethyl alcohol
- basic, splitting off diethyl amine.

All three need water to cure, the water is not split off as written

here.

Because water has to diffuse into and the acid/alkohol/amine

has to diffuse outward, the process is only practical up to say

10 mm, or if there is ample time (days at least), maybe 20 mm.

Silicone compounds used to seal electric equipment uses different crosslinking chemistry, without condensation mechanisms.

regards

Georg

GeorgSc

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[Brian R Pateman](#)
Moderator



Join Date: Jun 2005
Location: Western Lake District, Cumbria (CA20) - UK
Posts: 1,266

Re: Pitch for potting transformers

Quote:

Originally Posted by **dominicbeesley** *Is pitch still poored into the junctions boxes used in under-road electrical distribution wiring? (I must admit the only book I have on the subject must be at least 60 years out of date!)*

Dom

Not for a long time.

These now use a two-part cold set epoxy and have for about 30 years.

Regards,

Brian

Forum moderator.

Brian R Pateman

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[XTC](#)
Heptode

Join Date: Oct 2004
Location: Bristol
Posts: 616

Re: Pitch for potting transformers

Quote:

Originally Posted by **GrimJosef** *In this case I still think my best chance might be to check out roofing pitch. Provided I don't get the synthetic stuff I think it'll be the closest thing to the original material. And it will be diluted (I imagine by at least 10 to 1) by the stuff that I recover. So with luck the acidity will not have a big effect. Furthermore the roofing stuff can't be too corrosive or it would attack the nails which hold the roofing boards down. If I'm really worried I might dip the transformer itself in pure original bitumen and build up as thick a layer of this as possible before fitting it back into the can and filling the remaining space with the mixture of old and new.*

Wish me luck !

Cheers,

GJ

There's also a special grade of pitch sold in small quantities for the final finishing of astronomical telescope mirrors. Check out telescope making suppliers. It will be refined to have properties suitable for finishing mirrors, which won't necessarily be low acidity etc needed for transformers, but I'd say it was a better bet than roofing pitch. The suppliers may have a detailed spec.

e.g.

<http://www.scientificmirrors.co.uk/T...pe-making.html>

but there are others I'm sure.

I'd say you were better off going for a synthetic compound as used in modern transformers. You can take the quest for authenticity too far.

I wish you luck whichever way you choose to go.

Pete.

XTC

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19th Feb 2009, 09:50 PM

#18


[GrimJosef](#)

Pentode

Join Date: Sep 2007
Location: South
Oxfordshire
Posts: 149

 **Re: Pitch for potting transformers**

Quote:

Originally Posted by **GeorgSc** 
Pitch is the black residue when heating pine rosin (=colophonium) or from pine tar distillation.

Maybe in Germany it is. But in other places the word can be used to describe substances derived from coal. See for example "ASTM D 450" which is the US government standard for "Coal-Tar Pitch used for Roofing, Dampproofing and Waterproofing". Or scroll down this page <http://www.hse.gov.uk/acronym/> to CTPV where the UK Health and Safety Executive explain that the acronym stands for "Coal Tar Pitch Volatiles". Or if you follow Pete's link you'll

find the mirror-grinding people call their stuff "Coal Pitch Tar"

I'm sure you're right that there was once a special substance used for sealing wooden beer barrels, and that the people who made and used it called it "pitch", and that we probably can't buy it any more. But I'm looking for a different substance, and I think that the people who make and sell that may call it "pitch" or "bitumen" or "tar". And, of course, it doesn't really matter what they call it. I just want stuff which is as near as possible to what's in my transformer cans. And this, I'm pretty sure from the smell, is coal- or oil-based 🍌

Cheers,

GJ



GrimJosef

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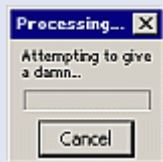
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19th Feb 2009, 09:59 PM

#19

[Sean Williams](#)

Moderator



Join Date: Feb 2005
Location: St.Ippolyts,
Hitchin, Hertfordshire QRA
IO91UW
Posts: 2,105

Re: Pitch for potting transformers

Potting compound is still safer to use though, and is perfectly safe on all winding wire.

Besides if this is for Quad 2 transformers you cant see what the transformer is potted in!

Happiness is a cherry red anode 🍌

Are you a member of the [YCHJCYA2PDTHFH](#) club?



Sean Williams

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19th Feb 2009, 10:45 PM

#20

[GrimJosef](#)

Pentode

Join Date: Sep 2007
Location: South Oxfordshire
Posts: 149

Re: Pitch for potting transformers

Quote:

Originally Posted by **Sean Williams**
Potting compound is still safer to use though, and is

perfectly safe on all winding wire.

Besides if this is for Quad 2 transformers you cant see what the transformer is potted in!

Better ? Probably.
Cheaper ? Probably.
Easier ? Certainly.
Safer ? Yes.

Original ? No.

This is just a hobby for me, I'm not trying to save time or money (ask my wife 😊!). Call it perverse if you like, but my satisfaction comes from knowing that I've restored something to as near its original condition as I can get it. And these transformers were originally potted in nasty, smelly, black stuff ...

Cheers,

GJ

Last edited by GrimJosef : 19th Feb 2009 at 10:54 PM.



GrimJosef

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Components and Circuits



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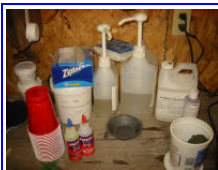
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Waterproofing

Before you decide to waterproof something, make sure that it really needs to be waterproofed. It was sure a surprised me, but most DC motors will run just fine completely flooded with water, even salt water. All sorts of DC electronics will work without any protection, including solenoids, linier actuators, reed switches, and toggle switches. Now if you can protect these things from water then they will certainly last longer, but it good to know that water does fine its way end the it is not going necessarily cause an immediate failure.



(1) Epoxy, talc, RTV, modeling clay, mixing cups and zip lock bags also for mixing.

Waterproofing Electronics

(1) There are three ways I waterproof electronics and all involve encasing the electronics in waterproof coating of epoxy, RTV Silicone or wax. The process is called potting. You can buy real potting compound for around \$50 a pint., but common stuff works great and it is much cheaper and easier to find.

Epoxy Potting

Many of the components on circuit boards will not survive even moderate pressure changes. Harbor Branch Oceanographic actually did test on components in the hopes of avoiding the need for pressure resistant housings or entombing a board in epoxy. Epoxy comes in two parts and it starts hardening once they are mixed.

(2) I have pumps on the containers so mixing up a small batch is as easy as 1 pump from the catalyst jug for every 2 pumps from the larger resin jug. That goes into a zip lock bag and is squishing it around until it is mixed and then it is poured out.



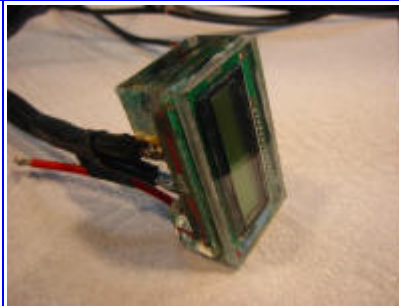
(2) Epoxy kit with pumps from www.jgreer.com



(3) 5 minute epoxy for small jobs



(4) Potting a circuit board



(5) The display is protected with a 1/4 inch piece of acrylic.



(6) First coat of epoxy and talc is allowed to dry in order to prevent damage from shrinkage.

Completed Photo

(7) Potting is completed and the plastic mold is removed.



(8) Modeling clay used to make a mold for epoxy around wire terminals on a relay.



(9) A 100 amp solenoid relay potted in epoxy. A plastic bag and clay were used make molds for the epoxy.

I often use modeling clay to make a temporary mold around the part I want to encase. A 1 1/2 gallon kit of epoxy and pumps cost about \$80 from www.jgreer.com
(3) For smaller parts I also keep on hand some 5 minute epoxy.

(4) (5) To water and pressure proof my "Watt's Up" amp hour meter I cut a

piece of 1/4 inch thick acrylic for the face plate, and glued it to the frame of the LCD display with RTV Sealant from the auto parts store. RTV is also used to temporarily hold more acrylic pieces in place that form a mold. Once the RTV is dry the mold is filled with epoxy and allowed to set. I made a clay dike around the negative wires used to measure the amps and the shunt they are soldered to.

You can also add talc to epoxy in order to stiffen the mix or even make the mix as thick as a paste. Adding talc also stretches your epoxy and saves you money. Wood flower, aka: fine saw dust also works as well as talc. If your belt sander has a collection bag then you already have a ready source for wood flower.

(6) When potting larger parts like the speed controllers for the trolling motors, it is a good idea to add talc or wood flower because it will also reduce the amount of shrinkage as the epoxy hardens because too much shrinkage might crush a component. If the epoxy will be more than 3/4 inch thick then it is also a good idea to completely cover the part with a first layer and allow that to harden. (7) Then the mold can be completely filled with a second batch.

(8) Plastic bags and clay from the craft store are easy ways to make a quick mold around a part that you want to pot. To pot a 100 amp solenoid relay I first sealed any small holes with RTV gasket sealer, then I put the solenoid end down in a zip lock bag and warped it with tape to keep it somewhat conformed to the shape of the solenoid. I filled the bag with epoxy and set it aside to dry. Once dry the tape and plastic bag peel off. It's easiest to do this when the epoxy is still soft because you can use a box knife to trim off the bulges that are not needed and make it look a little less like Frankenstein. The next step was to roll out some clay and make a mold around the wire terminals on one side and then fill that with a second batch of epoxy. (8) Finally as show in the photo a clay mold

was fashioned for the other side of the terminals and that was filled. (9) The completed part is ugly, but it is very waterproof.



(1) RTV Silicon. Mixed from 2 solutions, it dries in hours and remains flexible.



(2) RTV Silicone gasket sealer is available an auto part stores.

RTV Silicone Sealant

(1) If pressure is not and issue then RTV Silicon is a good choice. It dries in hours is a great shock absorber and stain relief for wiring. And unlike epoxy, it can also be easily cut away if a change or repair is needed. You can buy RTV silicone from www.jgreer.com for about \$60 for 1/2 gallon. It comes in two parts, that are mixed together like epoxy.

(2) For small jobs you can also buy



(4) Blue RTV gasket sealer used to seal around the wires before 2 part RTV was poured into place.



(5) RTV seals the helm control box from water and provides a strain relief for the wires.

RTV silicone gasket sealer in a tube from the auto parts stores for about \$5.

(4) (5) I used RTV to seal the wires going into the helm control box. This box will be exposed to water but not routinely submerged. wires entering the box were first sealed with RTV Silicon gasket sealer just to plug the hole so that the two-part RTV would not leak out. The RTV in a tube is more like tooth paste and the two part RTV is like pancake syrup.

I used a piece of duct tape to close up the side and make a mold that could contain the two part RTV which if very fluid when first mixed. With the mold filled it was just left to dry overnight.

Machineable Wax

Sometimes epoxy is no good because you want to be able to replace a part and RTV is no good because the pressure is high or the part is so large that you don't want to spend that much money. That is when candle wax is a good choice. The only real problem with wax is that a hot day can turn it back to a liquid.



(1) Machineable wax



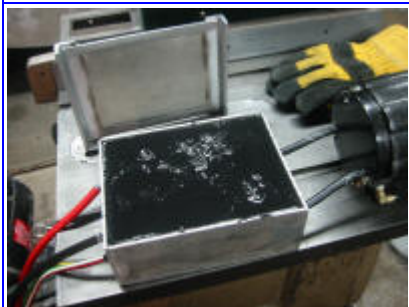
(2) DIY machineable wax is 1 part polyethylene to 4 parts wax.



(3) The mixture will be dangerously hot in order to melt the plastic so wear gloves. Do not follow my example. :)



(4) Winch power relay box.



(5) Filled with molten machineable wax.



(6) Having machineable wax around is also nice for its intended purpose for making prototype parts.

(1) However machineable wax that is designed for prototype work with a mill or lathe softens around 230 degrees and it is much harder than the regular candle wax. You can get machineable wax from

www.machinablewax.com or www.freemansupply.com. A 2 in. x 6 in. x 18 piece is about \$50.

(2) If you want to save some money, you can make your own machineable wax by melting polyethylene plastic into candle wax. Since cheap is my middle name I came home from Home Depot with a roll of plastic and a chunk of wax from Hobby Lobby. I also pilfered some of Kay's candles that were almost at the end of their life.

I am certain it will depend on the actual type of polyethylene plastic you use, but a mixture of 1 part plastic

to 4 parts wax and by weight was enough to raise the melting point to 170 degrees, an 80 degree increase. It also makes the wax much harder..

Do be careful. If you think hot wax is painful, just wait until you get some molten plastic on you. Also candle wax becomes very flammable when it is hot enough to melt the polyethylene plastic, so do this outdoors with a lid to cover the pot when it burst into flames.

(4) I used my first batch of machineable wax to waterproof a box that contains power relays which control the winch. (5) A little duct tape was used to seal around the power cables and then the box was filled with molten machineable wax.

If needed the mixture can be removed by patiently melting it with a torch. It takes about 3 hours to remove 3 pints. I know this because I failed to sufficiently tighten the ground wire screw and before I poured the wax into the box. And the wax managed to isolated the wire and stop it the wench from working!

(6) You can also use machineable wax for it's intended purpose which is making prototype parts or in my case making a model of a part the will be cast in aluminum.

<http://www.submarineboat.com/waterproofing.htm>

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MarkAren [View profile](#)

More options Dec 18 2007, 12:28 am

wsgroups: **rec.radio.amateur.homebrew**
From: **MarkAren <markare...@yahoo.com>**
Date: **Tue, 18 Dec 2007 00:28:58 -0800 (PST)**
Time: **Tues, Dec 18 2007 12:28 am**

Subject: **potting - hot melt gule and two part epoxy**

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Hi All,

Has anyone attempted to use good old fashioned hot melt glue as an encapsulant for modules ?

Probably needs melting in a pot over a flame (with appropriate care).

A mould could me made out of Plexiglass with appropriate draft (angles) and high temperature release agent.

A second thought is to use standard two part fiberglass mix, obviously a lot more rigid, but potting boxes are likely to be needed also.

I guess I could use thin walled pipe to house a long rectifier stack and associated capacitors.

Both of these options seem significantly less expensive than standard epoxy potting compound...

Any thoughts ?

Mark

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Pete
KE9OA [View profile](#)

More options Dec 18 2007, 6:10 am

wsgroups: **rec.radio.amateur.homebrew**
From: **"Pete KE9OA" <p.gian...@comcast.net>**
Date: **Tue, 18 Dec 2007 08:10:03 -0600**
Time: **Tues, Dec 18 2007 6:10 am**

Subject: **Re: potting - hot melt gule and two part epoxy**

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TenTec used hot melt glue in the VCO modules of the Paragon transceiver, so this glue probably has good RF characteristics (hopefully). The expansion and contraction of this glue over varying temperatures did cause the solder joints to fracture over the years.....this was the downfall of the

Paragon.
I have used epoxy over the years, with good results. That is the direction I would go.

Pete

"MarkAren" <markare...@yahoo.com> wrote in message

<news:bea2b617-d630-4d0b-94eb-b7b61df630f4@i12g2000prf.googlegroups.com...>

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COLIN
LAMB [View profile](#)

More options Dec 18 2007, 6:58 am

wsgroups: **rec.radio.amateur.homebrew**
From: "COLIN LAMB" <k...@teleport.com>
Date: Tue, 18 Dec 2007 06:58:54 -0800
Local: Tues, Dec 18 2007 6:58 am

Subject: **Re: potting - hot melt glue and two part epoxy**

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Hot melt glue has a basic problem - it melts when it gets hot. It forever limits where the stuff can go. They must be kept out of a hot car, and the components cannot get hot.

I have used epoxy before and it works fine for all sorts of potting projects. You can color it or get it clear. Rf properties are good.

Remember, however, that when you encapsulate something, you trap the heat inside - so the temperature rise of the encapsulated components is greater than free air.

Colin K7FM

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pdrahn@coinet.com [View profile](#)

More options Dec 18 2007, 10:05 am

wsgroups: [rec.radio.amateur.homebrew](#)
From: "pdr...@coinet.com" <co_far...@yahoo.com>
Date: Tue, 18 Dec 2007 10:05:27 -0800 (PST)

Time: Tues, Dec 18 2007 10:05 am

Subject: Re: potting - hot melt glue and two part epoxy

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On Dec 18, 12:28 am, MarkAren <markare...@yahoo.com> wrote:

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The advantage of hot melt glue is it hardens quickly and even if it leaks out of your mold, will stop when cool. On the other hand, 2 part epoxy potting compound when mixed is about as thin as water and will stay that way for a couple of hours. It will leak from even the smallest crack or hole.

We use the 2-part epoxy potting compound in custom milled enclosures for motorcycle control units. The enclosure has two connectors that have to be sealed in with RTV before the potting compound is added.

This also occurs to me while thinking about our past potting runs. The hot melt glue will NOT fill all the voids in your unit. Air bubbles will be trapped and will not be able to get out. The epoxy we use takes 24 hours to harden at room temp and this allows time for air bubbles to escape. We have to add more epoxy to each unit for the first 10-15 minutes as air escapes.

Hope this helps a little.

Paul, KD7HB

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PhattyMo [View profile](#)

[More options](#) Dec 18 2007, 11:21 am

wsgroups: [rec.radio.amateur.homebrew](#)
From: PhattyMo <Phatt...@nospam.gmail>
Date: Tue, 18 Dec 2007 11:21:18 -0800
Time: Tues, Dec 18 2007 11:21 am

Subject: Re: potting - hot melt glue and two part epoxy

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One other concern a few people expressed when I was looking for "alternative" potting compounds- Most epoxies,etc. contract a bit when they harden/cure. This can (and apparently has,in instances?) "sheared" components from the PCB's they were soldered to. The device might work fine,ya pot it,and it works fine..than the epoxy cures,and it doesn't work anymore because of 'sheared' leads,and cracked solder joints. Just something to be aware of.

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Joel
[KoltnerView profile](#)

[More options](#) Dec 18 2007, 11:26 am

wsgroups: **rec.radio.amateur.homebrew**
From: "Joel Koltner" <zapwireDASHgro...@yahoo.com>
Date: **Tue, 18 Dec 2007 11:26:36 -0800**
To: **Tues, Dec 18 2007 11:26 am**
Subject: **Re: potting - hot melt gule and two part epoxy**
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"pdr...@coinet.com" <co_far...@yahoo.com> wrote in message

<news:96108bc8-cfdc-4c67-bb8f-4014f09c6ae8@s12g2000prg.googlegroups.com...>

> This also occurs to me while thinking about our past potting runs. The
> hot melt glue will NOT fill all the voids in your unit. Air bubbles
> will be trapped and will not be able to get out.

Other than appearance, is there a downside to trapped air bubbles?

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Clint
[SharpView profile](#)

[More options](#) Dec 18 2007, 9:23 am

wsgroups: **rec.radio.amateur.homebrew**
From: **Clint Sharp** <cl...@clintsmc.demon.co.uk>
Date: **Tue, 18 Dec 2007 17:23:27 +0000**
To: **Tues, Dec 18 2007 9:23 am**
Subject: **Re: potting - hot melt gule and two part epoxy**

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In message <13mfo10tmlv2...@corp.supernews.com>, COLIN LAMB

<k...@teleport.com> writes

>Hot melt glue has a basic problem - it melts when it gets hot. It forever
>limits where the stuff can go. They must be kept out of a hot car, and the
>components cannot get hot.

>I have used epoxy before and it works fine for all sorts of potting
>projects. You can color it or get it clear. Rf properties are good.

>Remember, however, that when you encapsulate something, you trap the heat
>inside - so the temperature rise of the encapsulated components is greater
>than free air.

And don't forget, anything you encapsulate becomes a potential shrapnel
bomb. I can vouch for this, having had a near miss with more than one
device that had been factory potted in epoxy.

>Colin K7FM

--

Clint Sharp

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Highland
Ham [View profile](#)

More options Dec 18 2007, 3:05 pm

wsgroups: [rec.radio.amateur.homebrew](#)

From: **Highland Ham** <abcm0csz.kn6wh...@dsl.pipex.com>

Date: **Tue, 18 Dec 2007 15:05:19 -0800**

Time: **Tues, Dec 18 2007 3:05 pm**

Subject: **Re: potting - hot melt glue and two part epoxy**

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MarkAren wrote:

> Both of these options seem significantly less expensive than standard
> epoxy potting compound...

> Any thoughts ?

=====

Hot melt ,when fluid, might have too high a temperature for the components
to be encapsulated.

Frank KN6WH / GM0CSZ

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Doug
White [View profile](#)

More options Dec 18 2007, 3:13 pm

wsgroups: **rec.radio.amateur.homebrew**

From: **gwh...@alum.mit.edu (Doug White)**

Date: **Tue, 18 Dec 2007 23:13:40 GMT**

Time: **Tues, Dec 18 2007 3:13 pm**

Subject: **Re: potting - hot melt gule and two part epoxy**

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Some "pro" potting compounds are 2-part RTV rubber. This presumably has a bit more "give" than a rigid epoxy & is less likely to rip parts off a board. Another thing to watch out for with two-part materials is that the ones that aren't designed for potting can get very hot when they cure. That's one reason you want a very slow curing cycle.

A long time ago I potted a bunch of satellite circuitry in an epoxy filled with hollow glass microspheres to make it light. The thermal conductivity was terrible, so you had to be careful to heat sink anything that might get warm.

Doug White

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Highland
Ham [View profile](#)

More options Dec 18 2007, 3:15 pm

wsgroups: **rec.radio.amateur.homebrew**

From: **Highland Ham <abcm0csz.kn6wh...@dsl.pipex.com>**

Date: **Tue, 18 Dec 2007 15:15:11 -0800**

Time: **Tues, Dec 18 2007 3:15 pm**

Subject: **Re: potting - hot melt gule and two part epoxy**

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Pete KE9OA wrote:

> TenTec used hot melt glue in the VCO modules of the Paragon transceiver,
> so this glue probably has good RF characteristics (hopefully). The

> expansion and contraction of this glue over varying temperatures did cause
> the solder joints to fracture over the years.....this was the
> downfall of the Paragon.

=====
In 1991 I bought a second hand TenTec Paragon trxstill going strong as
my main HF transceiver. But tnx for the aboveif VCO ever
fails I know what the reason could be.

Frank KN6WH / GM0CSZ

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Yaz
[GatesView profile](#)

[More options](#) Dec 18 2007, 3:35 pm

wsgroups: **rec.radio.amateur.homebrew**
From: **Yaz Gates <yazga...@hotmail.com>**
Date: **Tue, 18 Dec 2007 23:35:49 GMT**
Local: **Tues, Dec 18 2007 3:35 pm**
Subject: **Re: potting - hot melt gule and two part epoxy**
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Watch out for resins or epoxy. There are big stains put on the parts
when it sets, and again over temperature changes. I've tried it, and had
parts break in two inside the resin. The potting has to have some give.

Jim

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Tehrasha
Darkon [View profile](#)

[More options](#) Dec 18 2007, 9:49 pm

wsgroups: **rec.radio.amateur.homebrew**
From: **Tehrasha Darkon <dar...@netins.net>**
Date: **Wed, 19 Dec 2007 05:49:01 +0000 (UTC)**
Local: **Tues, Dec 18 2007 9:49 pm**
Subject: **Re: potting - hot melt gule and two part epoxy**

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Im suprised nobody has bothered to ask this....

What is the potting being used for? Moisture, vibration, HV isolation ??

Depending on the use, the 'good enough' alternative might vary considerably.

--Teh

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Andrew
VK3BFA [View profile](#)

More options Dec 20 2007, 4:26 am

wsgroups: **rec.radio.amateur.homebrew**
From: **Andrew VK3BFA <vk3...@hotmail.com>**
Date: **Thu, 20 Dec 2007 04:26:51 -0800 (PST)**
Subject: **Thurs, Dec 20 2007 4:26 am**

Subject: **Re: potting - hot melt gule and two part epoxy**

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On Dec 18, 7:28 pm, MarkAren <markare...@yahoo.com> wrote:

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Epoxy, as described by others, tends to stress the components - one notable job I had was the vco in a Yaesu FT480R - took AGES to chip away with a fine wood chisel after using a blowtorch to open up the brass enclosure.....one of those "personal challenge" jobs.

I use good old fashioned beeswax. Good rf properties, easy to use, easy to dig out if needed. Bigger all mechanical strength, but ideal for vibration damping ie oscillators etc. Repotted the Yaesu VCO, no reported problems after 3 years....

Andrew VK3BFA.

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Dave
Platt [View profile](#)

More options Dec 20 2007, 11:50 am

wsgroups: **rec.radio.amateur.homebrew**

from: **dpl...@radagast.org (Dave Platt)**

date: **Thu, 20 Dec 2007 11:50:21 -0800**

date: **Thurs, Dec 20 2007 11:50 am**

subject: **Re: potting - hot melt gule and two part epoxy**

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>Epoxy, as described by others, tends to stress the components - one
>notable job I had was the vco in a Yaesu FT480R - took AGES to chip
>away with a fine wood chisel after using a blowtorch to open up the
>brass enclosure.....one of those "personal challenge" jobs.

Several notes re epoxy for encapsulation:

- Epoxy formulations vary a lot in their hardness and rigidity, viscosity when fluid, cure rate, and rapidity of heat release during cure. Most of the big epoxy companies seem to make at least one variety which is specifically intended for use when encapsulating electronic components. These formulas seem to be more flexible when cured, and some of them are being advertised as providing shock and thermal-stress protection.
- Other commercial electronic-gear encapsulants seem to be based on urethane, or on two-part silicone rubber formulas.
- I've had some success in doing small encapsulating projects by using a mixture of a low-viscosity slow-cure epoxy (one of the TAP Plastics formulas) and fine white sand, mixed up in a thick slurry. This mix is a good deal less expensive than using straight epoxy resin, it has much less shrinkage, and should have rather better thermal conductivity. When it's poured into a mold, the sand tends to settle to the bottom before the epoxy hardens, leaving the top layer in the mold as nearly-pure resin (a nice smooth surface).

--

Dave Platt <dpl...@radagast.org>

AE6EO

Friends of Jade Warrior home page: <http://www.radagast.org/jade-warrior>

I do not wish to receive unsolicited commercial email, and I will boycott any company which has the gall to send me such ads!

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dougfgd@gmail.com [View profile](#)

More options Dec 23 2007, 6:34 pm

wsgroups: **rec.radio.amateur.homebrew**
From: "doug...@gmail.com" <doug...@gmail.com>
Date: **Sun, 23 Dec 2007 18:34:55 -0800 (PST)**

Time: **Sun, Dec 23 2007 6:34 pm**

Subject: **Re: potting - hot melt gule and two part epoxy**

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I had occasion to pot very high impedance circuit in 2 part black potting compound, when apparently set it failed to function correctly, after 2 days all was ok.

my conclusion was that the chemical reaction was generating conducting ions and conduction ceased when the reaction finished.

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robert
casey [View profile](#)

More options Jan 5 2008, 3:07 pm

wsgroups: **rec.radio.amateur.homebrew**
From: **robert casey** <wa2...@ix.netcom.com>
Date: **Sat, 05 Jan 2008 18:07:36 -0500**

Time: **Sat, Jan 5 2008 3:07 pm**

Subject: **Re: potting - hot melt gule and two part epoxy**

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Pete KE9OA wrote:

> TenTec used hot melt glue in the VCO modules of the Paragon transceiver, so
> this glue probably has good RF characteristics (hopefully).

A way to test hot melt glue would be to place a small piece on a paper plate in the microwave oven, along with a cup of coffee to the side (as a dummy load to keep the oven happy). See if it gets warm.

>>Has anyone attempted to use good old fashioned hot melt glue as an
>>encapsulant for modules ?

>>Probably needs melting in a pot over a flame (with appropriate care).

A double boiler set up may be better for that.

>>Both of these options seem significantly less expensive than standard

>>epoxy potting compound...

I suppose an advantage of hot melt glue is that you could de-encapsulate stuff easier if you ever needed to.

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robert
casey [View profile](#)

More options Jan 5 2008, 3:13 pm

wsgroups: [rec.radio.amateur.homebrew](#)
From: **robert casey** <wa2...@ix.netcom.com>
Date: **Sat, 05 Jan 2008 18:13:20 -0500**
Subject: **Sat, Jan 5 2008 3:13 pm**

Subject: **Re: potting - hot melt gule and two part epoxy**

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> Some "pro" potting compounds are 2-part RTV rubber. This presumably has
> a bit more "give" than a rigid epoxy & is less likely to rip parts off a
> board.

Kenwood used something like that in the TS440SAT transceiver, on the VCO if I recall correctly. Seems the stuff would sometimes corrode some of the circuitry after several years.

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