

## A Commentary on Paint Application (taken from an IPMS forum)

All paints are made of 3 basic components. Solids or pigments, binders and solvents or thinners. The key difference is the binders and solvents. These are the basic "glues" that make paint stick. The binder is the solid glue and the solvent dissolves it to make it liquid.

Lacquer's solvents are based primarily on acetone and MEK with some other solvents thrown in. These solvents are the "hottest" and will generally dissolve almost anything. The "other" solvents and proportions are what differentiate various Lacquer thinners. The best automotive lacquer thinners have more of the expensive solvents and less acetone in them. They do a better job of dissolving the binders and pigments, but the more of these solvents the more expensive they become. This is why there is a significant difference in the price and action of auto paint shop and Home Depot lacquer thinner. Home Depot is mostly acetone. High end thinners are also more prone to attacking plastic.

Enamel thinner is mostly naphtha AKA mineral spirits or paint thinner. This is a slightly less aggressive than the solvents in lacquer thinner. Depending on the mix and the lacquer, enamels it can be used over lacquer.

Acrylic paints are commonly referred to as "water"based but the reality is that the primary solvent is alcohol. That is what gives acrylics that slightly "sweet" smell. Because dilute alcohol will not generally dissolve lacquers or enamels it can be used over them. Also some acrylics can be thinned with lacquer thinner. Tamiya recommends this when you want a "harder" finish. Doing this however, precludes using it this way over enamels.

Now a bit about acrylic as used in paint. Acrylic correctly describes the pigments used, not the thinners. Acrylic is a synthetic pigment, not a natural mineral pigment such as titanium(white) or ochre(red) which occur naturally. Before the advent of acrylics, natural pigment came mostly from the ground and were dug up and crushed for use in paint. This word is very much misused to describe a type of paint but it has become a part of the general lexicon and as such we are kind of stuck with it.

Now, what can be used over what? Alcohol based over all. Naphtha over lacquer but not alcohol and lacquer on the bottom. Having said that here comes the caveat. Because 91% alcohol used straight undiluted, will dissolve some lacquer paint, if given enough time, all of these have compatibility issues. Laid down in light coats so the solvents will evaporate quickly, they can all be used with each other. If the solvent doesn't have time to attack the layer beneath, then no issue. Lay on a thick coat and you have problems.

I mentioned compatibility. This is when you get the wrinkling and the paint bubbles up. This occurs as a result of paint shrinkage as it cures. All paints shrink some as they cure. That is the nature of the beast. When you get two paints that shrink at different rates then you get the wrinkling. It is made worse because if they shrink at different rates, they also expand at different rates. When you have a cured layer and you spray a new layer down, if the old layer absorbs the new thinner it will start to expand and as the two shrink back at different rates, then you get wrinkles. There is no formula to tell you when this will or will not happen so you can only do a test shot to see.

As a retired Chemical Engineer, I felt compelled to add some clarification to PeteJ's good explanation.

The "sweet" smell of the acrylics is more likely to be from "glycols" that are added to the paint to get the paint to flow smoothly. Other glycols that you know are automotive antifreeze (ethylene glycol).

The acrylics that PeteJ mentioned are not pigments but the binders in acrylic paint. They are long spaghetti-like molecules that glue the paint pigments to the surface that you are painting. Acrylic clear coat is just acrylic binder and solvent; no pigments.

The pigments that PeteJ mention come in two categorizes: Inorganic and Organic. The inorganic pigments are, as PeteJ says, natural minerals. Ground up dirt if you will. Examples are Titanium White, Yellow Ochre Ultra Marine Blue. The organic pigments are usually man made chemicals or molecules that were originally extracted from crude oil or coal tar. Some of these were first discovered by German Chemists in the late 1800's. Examples are: Phthalo Blue, Phthalo Green, Napthol Red.