

Solubility of MY Polymers coatings and adhesives

This document provides a general guide line for the dilution of the low refractive index resins in the range of RI of 1.32 to 1.42. These resins are soluble in fluorinated solvents and their mixtures with other more common solvents. At higher solids content of 50-100% they are soluble in common solvents such as acetone and other ketones and ester solvents. At higher dilution (lower solids content) they may form turbid solutions or even separate into two phases if diluted with those common solvents. The higher dilution requires the use of mixture with fluoro solvents. The level of the fluoro solvent that is required to solubilize these products depends on the exact level of dilution. More dilution requires a higher level of the fluoro solvent. It also depends on the specific resin and the specific solvent.

The table below shows limits of solubility of one resin, MY-133MC with a few solvents arranged by their relative volatility. The data shows the minimum level of the product in a solvent below which the solution becomes turbid. Acetone in this case is the best non-fluoro solvent for these resins.

Complete solubility is only reached with fluorinated solvents such as HFE (hydro fluoro ethers) from 3M, Novec series starting with Novec 7100 boiling point 60°C and up to Novec 7700 boiling point 168°C or Vertrel (DuPont, bp 55°), Ashaiklin AE-3000 (AGC, bp 60°C) and the like .

The solubility is better obtained with mixed solvents containing 20-90% of the fluorinated solvents. For instance, 75/25 wt.% HFE-7100/acetone. Acetone can be replaced by alcohols (ethanol, IPA) or esters (ethyl acetate, butyl acetate).

Table 1: Minimum resin content that enables solubility in a selection of solvents.

Solvent	Relative Volatility (BA=1)	Boiling point °C	Solubility
HFE-7100 (+ some common solvents)	>6	60	full
HFE-7300 (+ some common solvents)		98	full
Acetone	6	56	>15%
Butyl acetate (BA)	1	124	>25%
Oxsol 100		139	>30%
PMA(propylene glycol methyl ether acetate)	0.34	145	>25%

For example, what this table shows is that MY-133MC is completely soluble at, e.g. 20% solids in acetone but will form a turbid solution at e.g. 10% solution. Addition of some fluoro solvent to the acetone will affect full solubility even at high dilution.

The minimum level of HFE-7100 which enables complete solubility of some other resins is shown in the following table. Here again, the added HFE-7100 is only necessary below a solid content of 20-50%. Above that level, acetone is a good solvent.

Table 2: Maximum level of acetone in acetone/HFE mixtures that enables high dilution (low solids) of different resins.

Resin	Acetone/HFE-7100
OF-133	50/50
OF-134	50/50
OF136	80/20
MY-133V2000	57/43
MY-139	90/10
LOCA 133*	60/40
MY-133MC	50/50

* LOCA 133 is normally supplied as 35% in HFE-7500, hence, it can be further diluted with pure acetone down to at least 15% solids.

Important note: This report is somewhat hard to understand due to a misconception that resins have a limited solubility in the other direction. This report emphasizes the fact that resins are more soluble at high concentration and less so at low concentrations.

Another practical note: For most applications the user do not need to reach high dilution. If dilution is only needed to reduce viscosity, slight dilution of 10-20% solvent (acetone, methanol...) will dramatically affect it. No need for high dilution.

If dilution is necessary to reach thin coatings, the range of solids of 25-50% will probably be sufficient and the level of the fluoro solvent will be much below that mentioned in the above Table 2.

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