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**NuPlon™ Resin**

Technical Application: Dyes and Colorants

## **Background**

Nuplon is an environmentally-friendly, biodegradable, thermoset plastic which can be used in a wide variety of applications. The liquid precursor can be cured by heating 130 – 170 °C to form ester crosslinks which convert the liquid into a hard plastic that can be used for a variety of commodity and disposable applications. Over the course of 2-3 months of water exposure these links break down eliminating the environmental impact of Nuplon.

## **Goal**

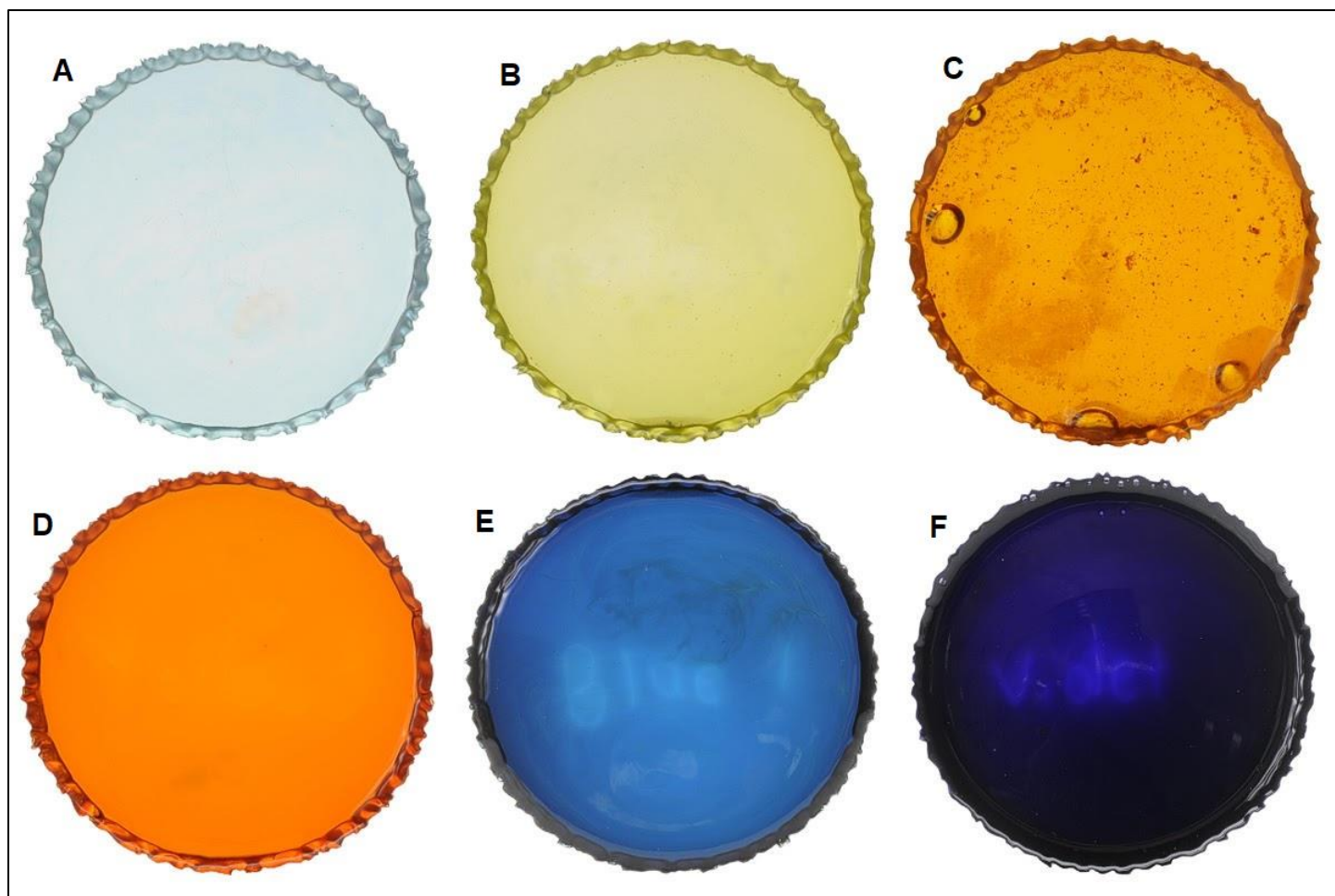
Because dyeing plastic to form a variety of colors is preferred for an array of applications ranging from toys to house-hold items, testing was performed using Nuplon resin to determine if it could be dyed.

## **Method**

A series of shallow aluminum dishes were loaded with ~ 4-8 grams of liquid Nuplon Resin (type M317) and a small amount of a series of dyes was added to each one. The Resin was subsequently heated in 130 °C oven to cure overnight. The dishes were peeled off from the cured plastics and the formed pieces were photographed.

## **Results**

**Figure 1** shows the resultant dye-stained series of Nuplon plastics. These are labelled in figure as dyed A – F.



**Figure 1.** Resultant dye-colored pieces of Nuplon Plastic.

These correspond to the following dyes

Letter	Dye	Notes
A	FD&C Blue 1 powder Food Blue 002 CAS# 3844-45-9	Dissolved fully
B	FD&C Yellow 6 powder Food Yellow 03 CAS#2783-94-0	Dissolved fully
C	FD&C Red 3 Powder Food Red 014 CAS# 16423-68-0	Only partially dissolved, partially remains as powder
D	FD&C Yellow 5 Powder Food Yellow 04 CAS# 1934-21-0	Dissolved fully
E	Spectra Blue 1 Liquid CAS# 3844-45- 9	Dissolved fully
F	D&C Violet 2 Solvent Violet 013 CAS# 81-48-1	Dissolved poorly in liquid resin but dissolved fully during heating to cure.

### **Conclusion**

The Nuplon product can be dyed by mixing liquid dyes in with the resin prior to curing. This process works well for several dyes. However, certain dyes, such as FD&C Red #3, do not dissolve well into the material and should be avoided. Small-scale testing to ensure dye solubility prior to formation of larger mixtures is suggested.

### **Customizability**

Incorporation of varying additives can be used to modify the NuPlon™ materials properties to provide for a wide array of properties. Contact John Garner ([jg@akinainc.com](mailto:jg@akinainc.com)) to discuss customization opportunities to meet your needs.

### **Licensing Considerations**

The NuPlon™ platform technology is PATENT PENDING with a priority date of filing established from provisional filing on June 25, 2020. The user's guide presented here contains information from laboratory testing at Akina, Inc. In no way does it represent all the potential uses and considerations for the NuPlon™ material. Contact John Garner ([jg@akinainc.com](mailto:jg@akinainc.com)) for joint development and licensing opportunities.