Utilizing Peanut Oil in Oil-Based Paints and Stains

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Introduction

Our previous work in formulating peanut oil-based coatings involved incorporating peanut oil with linseed oil, along with drying agents, to produce a drying oil for producing durable surface coatings. We demonstrated that the peanut oil may be loaded into linseed oil at a rate of 5% without diminished coating hardness or drying time.

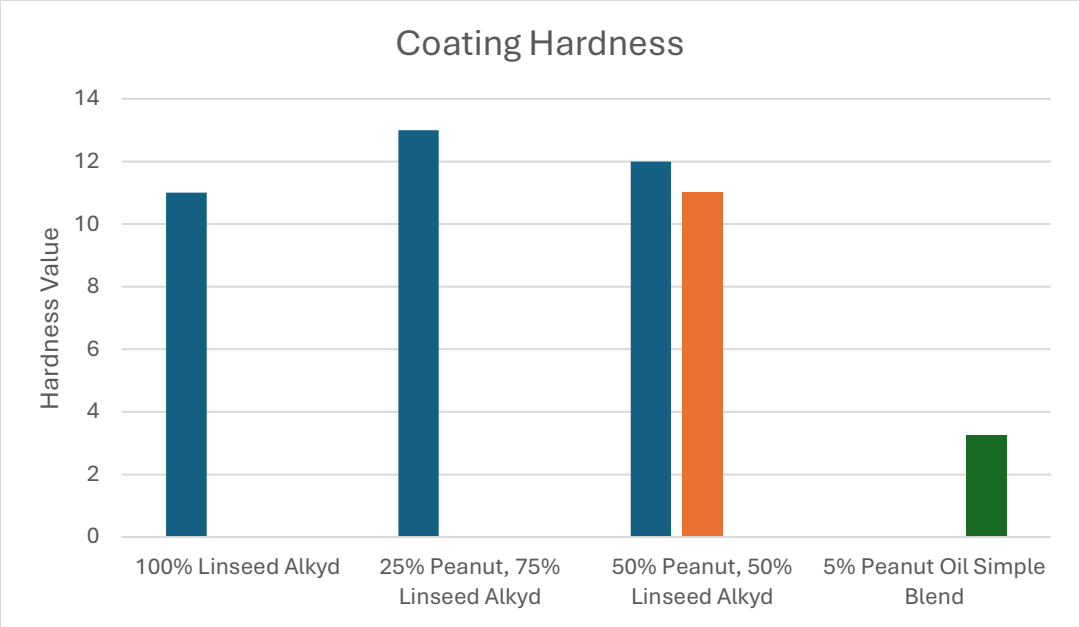
As a next step, we proposed synthesizing alkyd resins from peanut/linseed blends to increase the amount of peanut oil in the formulation. The development of a peanut oil derived alkyd resin also broadens the potential market for this coating, as alkyds are widely used for high-durability applications, including metal and wood paints, deck stains, enamels and urethane paints.

In our phase II research, we have developed a peanut-linseed alkyd resin in which 50% of the oil content is peanut oil. Furthermore, we formulated the alkyd into paints to demonstrate their practical function on both wood and metal substrates, as well as their ability to be formulated in a variety of colors.

Results

Coating Hardness

Alkyds were synthesized with the peanut oil portion ranging from 0-75% of total oil content, using glycerol as the polyol during synthesis. It was found that the hardness of the coating remained constant up to 50% peanut oil content. At 75%, the coating no longer cured in a reasonable amount of time, and coating hardness data could not be collected. 50% peanut oil loading was selected as the optimal concentration. To further increase the oil content of the alkyd, the synthesis was then performed to make a 50% peanut alkyd using alternative alkyds that facilitated 7% more oil with similar hardness and cure times.



Alkyd Resin	Dry Time (hours)
100% Linseed	5
25% Peanut	5
50% Peanut (alkyd 1, blue)	8
50% Peanut (alkyd 2, orange)	11

Paint Formulation

Previous drying oil formulations, as well as a prototype alkyd, performed well as a coating for wood surfaces, both as an oil stain and as a rudimentary pigmented paint. To demonstrate the wider applicability of the optimized alkyd resin, a paint was formulated for coating a metal substrate. A worn metal laboratory solvent cabinet was selected for the demonstration. The alkyd was thinned with mineral spirits, and graphtol red was used as a pigment to give the coating a red color. The paint was then applied using standard paint rollers available at hardware stores.

Figure 1: Metal solvent storage cabinet, before and after painting with 50% peanut oil alkyd paint

Conclusions & Ongoing Development

Our work on developing peanut oil alkyds has shown that a substantial amount of peanut oil can be loaded into these applications and achieve excellent results in a variety of paints and coatings.

In addition to paints, alkyd resins are often formulated into drying oils to improve durability and longevity of wood stains. Our current work involves incorporating our peanut oil alkyd into a drying oil formulation, as well as increasing the peanut oil content of the drying oil by

Figure 2: ***Left:*** *Example product utilizing alkyd in a drying oil formulation.* ***Right:*** *prototype coatings of peanut alkyd drying oil formulations.*

interesterification of peanut oil with linseed and/or tung oil. These formulations will also incorporate UV blocking minerals to impart resistance to sunlight.

Methods

To synthesize the alkyd resin, the peanut and linseed oils were first blended, along with candidate polyols, and reacted with catalyst in appropriate conditions. The resulting resin wood stain is shown in figure 3.

Figure 3: Final alkyd resin. Has honey-like viscosity that can be thinned with oil or solvent into a variety of applications.