Use of Soybean Meal for Adhesive Purposes*

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RELATIVE to the use of soy-bean meal as a complete sizing medium, much has to be done to acquire a complete sol of 100% such as can be obtained from animal glue and milk casein. Although soy-bean meal is used successfully in the wallpaper industry in amount ranging from 30% to 50%, it mixes with animal glue or casein.

Upon microscopic observation we find very minute particles of the meal surrounded with the glue or casein which acts as a colloid protector. In the manufacture of washable wallpaper a protein sizing must be used to suspend the clay and colors that are applied with suitable machinery to the plain paper.

When the wallpaper is grounded and a pattern placed thereon, it is dried by being festooned and heated, air blown over the paper to quicken the drying. It must then have an after treatment with a 3% solution of formaldehyde and water, or a 6% solution of aluminum sulphate, this being used to harden the protein sizing medium. It is very advantageous to add to the glue or casein 30 to 40% of soy-bean meal, it being a protein, is readily rendered insoluble with the after treatment solution and a much better tenacious film is secured than with the animal glue or casein alone.

Soy-bean meal is being used very favorably in the wood veneer industry for the lower grade work and no doubt as the users become more accustomed to its use, a better solvant will be found to produce a more perfect sol from the meal which may enable them to use it on higher class work.

Experiments are being conducted for the uses of soy-bean protein in the paper mills. A percentage is mixed with the rosin and soda ash and then run into the beater, intermixing with the paper fibre to which the aluminum sulphate is added. This procedure enables a better bond to be formed and when it is run on the Fourdrinier wire; the retention of the sizing is much improved, thereby preventing losses in the wash water.

One of our soy-bean processing companies are meeting good results by extracting the protein from the residue left after extracting the oil. The soy-bean protein is obtained by treating this residue with 0.2% caustic soda solution and coagulating with 0.5% sulphuric acid solution. This is termed the Alpha protein. The untreated soya bean meal is termed Gamma. The analysis of the Alpha and Gamma is as follows: Much better results are obtained by

	Alpha Protein	Gamma Protein
H_2O	11.1	6.7
Protein (Factor 6.25)	80.0	47.7
Protein (Factor 6.57)	85.7	50.1
K	Nil	Nil
Fibre	0.6	.6
Ash	2.5	6.13
80% Alcohol Soluble	5.0	24.3
Water soluble	4.3	43.2
Acidity	.144	.252
P. H.	4.5	6.3
S_2O	.047	.030
Oil	.7	.9

It is found that a complete solution may be obtained from the Alpha Protein as follows:

Water	100 cc.
Alpha Protein	15 grams
Ammonia 26%	1 gram
Caustic Soda	1 gram

the application of a little heat. It is fairly thin when freshly made but upon standing for a few hours it becomes more viscous.

The following is a report on the strengths of the Alpha and Gamma soy-bean when used in conjunction with casein. The strength is in lbs. per square inch, the test being made on thin veneers of wood-tested on a Riehle Testing machine such as would be made at the Bureau of Standards, Washington, D. C.

You will note that as more soya was used the strengths were less. There was less tendency for wood break and fibre pull where the soya was used in connection with the casein. In this test only the average run of casein was used as a control. With selected caseins one can obtain strengths of 800 lbs. per square inch using the same formula and then get 100% wood breaks.

The reason for using a lower grade casein in these tests was to get as much glue break as possible so it would not reflect too much against the strength of soya and would give a fair test.

The conclusions are that while the Alpha soya has shown higher strength than the Gamma it is not quite good enough to replace casein where it is necessary to have high strengths.

100 parts of Casein—620 lbs.

Casein	Alpha	Strength
90 parts	10 parts	562 lbs.
80 parts	20 parts	550 lbs.
60 parts	40 parts	542 lbs.
20 parts	80 parts	508 lbs.
	100 parts	530 lbs.

The Alpha soya shows much more strength than the Gamma. When using 100% soya quite strong solvants had to be used to dissolve it.

Casein	Gamma	Strength
90 parts	10 parts	512 lbs.
80 parts	20 parts	508 lbs.
60 parts	40 parts	510 lbs.
20 parts	80 parts	470 lbs.
	100 parts	382 lbs.

From this report you will find that when soya gets beyond 50% the strength begins to weaken proportionately. It seems the best mixture for strength would rest somewhere around twenty to forty per cent of soya. It is very noticeable that when the mixture of soya exceeds twenty per cent the flowing qualities are not as free as they should be.

*A PAPER PRESENTED AT THE FALL MEETING OF THE AMERICAN OIL CHEMISTS' SOCIETY, AT CHICAGO, OCTOBER 8-9, 1936