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A Mixing Procedure for Adiprene L-315/Polyol Adhesive

Unclassified

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A MIXING PROCEDURE FOR ADIPRENE L-315/POLYOL ADHESIVE

H. George Hammon

INTRODUCTION AND SUMMARY:

Adiprene L-315/polyol has been approved by LLL to replace Adiprene L-100/MOCA as a room temperature cured adhesive in many weapons and device applications. The use of MOCA has been severely restricted by OSHA (Occupational Safety and Health Administration). To assist those who need to use the adhesive, I am describing a mixing procedure for L-315/polyol adhesive, and a summary of properties of the cured material. Don Seaton of General Chemistry Compatibility Group will summarize the compatibility of the material. Most properties are similar but not identical to Adiprene L-100/MOCA.

DISCUSSION:

Formulation:	Adiprene L-315	100 parts by weight
	1,4-Butanediol	7 parts by weight
	Trimethylolpropane	2 parts by weight
	Ferric Acetylacetonate	0.03 parts by weight

Adiprene L-315 is available from E. I. duPont de Nemours Company, Elastomer Chemicals Department. We recommend that the material be purchased in 5 gallon lots, or larger, and be repackaged into cleaned, dried containers, in a dry atmosphere. It is desirable that the entire quantity in the repackaged container be used at once to avoid reopening and exposure to atmospheric moisture. Adiprene L-315 contains small amounts of free toluene diisocyanate, an eye and lung irritant. Take suitable handling precautions⁽¹⁾.

1,4-Butanediol is available from a number of sources, but should be obtained as Anhydrous Grade (about 500 ppm max. water) or dried (e.g. with molecular sieves) prior to use. Trimethylolpropane is also available from a number of sources (e.g., Matheson, Coleman and Bell) and should contain less than 0.5% water before mixing with butanediol. The ferric acetylacetonate is used in such small amount that special drying is unnecessary.

The polyols and catalyst should be compounded prior to mixing with the L-315. We recommend heating the 1,4-butanediol to about 60°C and adding the ferric acetylacetonate (FeAcAc) with stirring or shaking. When it is in solution, the trimethylolpropane is added, also at 60°C. Avoid heating much higher than 60°C, as that may cause the mix to turn cloudy, affecting the cure rate and stability of the polyol component.

Made in this manner, the polyol component is a clear, red-orange solution. At this time, we recommend that its shelf life be no more than 14 days, although it is probably good for a longer time. It is quite hygroscopic and should be protected from atmospheric moisture.

In preparing the adhesive, 9.03 parts by weight of the polyol component is added to 100 parts by weight of the Adiprene L-315 at room temperature. We recommend a minimum 109 gram batch and we mix by hand for 3 minutes⁽²⁾. The mixture should be vacuum degassed prior to use. Vacuum mixing has also been found to be satisfactory. The mixed adhesive has a pot life of 90-120 minutes. A higher viscosity, quicker-setting material can be made by preheating the L-315 to 50°C before adding the polyol component.

Properties of the material are summarized in Table 1. We are determining tensile properties as functions of strain rate and temperature. The properties are similar but not identical to Adiprene L-100/MOCA⁽³⁾. The L-315/polyol adhesive does not cure as rapidly at room temperature as L-100/MOCA, but attains adequate strength in 24 hours for most applications. Figure 1 shows butt tensile strength as a function of cure time at room temperature.

Table 1
Properties of Adiprene L-315/Polyol

Tensile Strength, MPa (psi)	about 28 (4000)
Elongation at break, %	about 300
Hardness, Shore A	88-90
Specific Gravity at 23°C	1.14-1.15
Linear Shrinkage, cured at 100°C, %	1.4
Linear Shrinkage, cured at 23°C, %	about 0.5

Figure 1

Butt Tensile Strength of Adiprene L-315/Polyol vs. Cure Time at 23°C.

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3. "Properties of Adiprene L-100/MOCA as a Room Temperature-Cured Adhesive and Possible Substitutes for It", H. George Hammon, UCID-16329, June 12, 1973.
4. See also interagency process specification (Sandia) No. 9916303, "Bonding, Polyurethane Elastomer".

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