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Comparison of ARALDITE® 2013-1 (ARALDITE® AV 144-2 / Hardener HV 997-1) & ARALDITE® 2013-2 (ARALDITE® AV 144-3/ Hardener HV 997-1)

NEW PRODUCT DEVELOPMENT REPORT

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INTRODUCTION

ARALDITE® 2013-2 is a new adhesive which has been developed to replace ARALDITE® 2013-1. This is due to a change in hazard classification of a raw material used in the resin component (ARALDITE® AV 144-2). The composition, characteristics and properties of the ARALDITE® 2013-2 remain similar to the existing ARALDITE® 2013-1 product.
The ARALDITE® 2013-2 comprises a new resin component (ARALDITE® AV 144-3) together with the existing hardener component (Hardener HV 997-1).
The following comparative report shows data obtained from laboratory testing of the new ARALDITE® 2013-2 against the existing ARALDITE® 2013-1 system.

TEST RESULTS

Unless otherwise stated, the figures given below were determined by testing standard specimens made by lap-jointing 100 x 25 x 1.6 mm strips of sandblasted aluminium alloy. The bond area was 12.5 x 25 mm, with bonded specimens cured under light clamping pressure. Lap shear testing was carried out at 23°C at 10mm/min unless otherwise stated.

Liquid properties

	ARALDITE® 2013-1 (ARALDITE® AV 144-2/ Hardener HV 997-1)	ARALDITE® 2013-2 (ARALDITE® AV 144-3/ Hardener HV 997-1)
Mix Ratio (resin : hardener)	100:60 by weight 100:100 by volume	100:60 by weight 100:100 by volume
Appearance (mix)	Grey paste	Grey paste
Viscosity (mix)	Thixotropic	Thixotropic
Working time (10g) 23°C	Ca. 2 hours	Ca. 2 hours

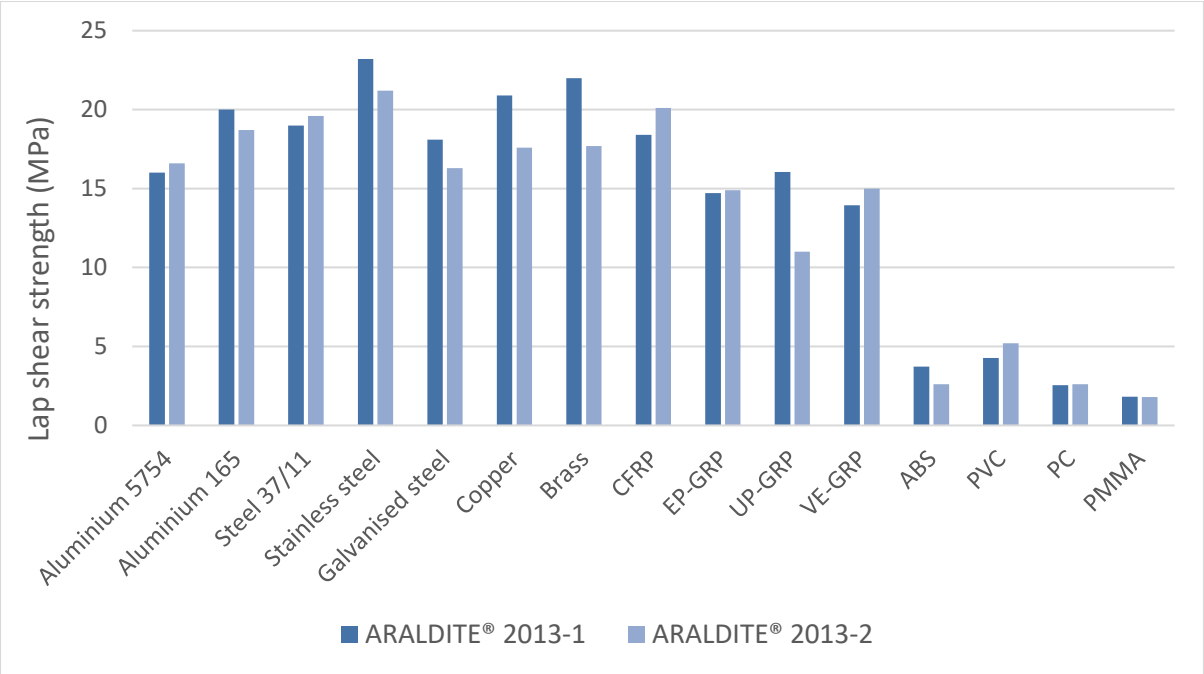
Handling/working strength

Time to reach handling strength (1 MPa) and working strength (10 MPa) on bonded specimens cured at different temperatures.

Cure temperature	Time to reach lap shear strength	ARALDITE® 2013-1	ARALDITE® 2013-2
Curing at 15°C	Time to 1 MPa	12 hours	10 hours
	Time to 10 MPa	16 hours	20 hours
Curing at 23°C	Time to 1 MPa	5 hours	6 hours
	Time to 10 MPa	10 hours	10 hours
Curing at 40°C	Time to 1 MPa	80 min.	80 min.
	Time to 10 MPa	150 min.	120 min.

Lap shear strength (LSS) on different materials (ISO 4587)

Cure: 16 hours at 40°C, tested at 23°C

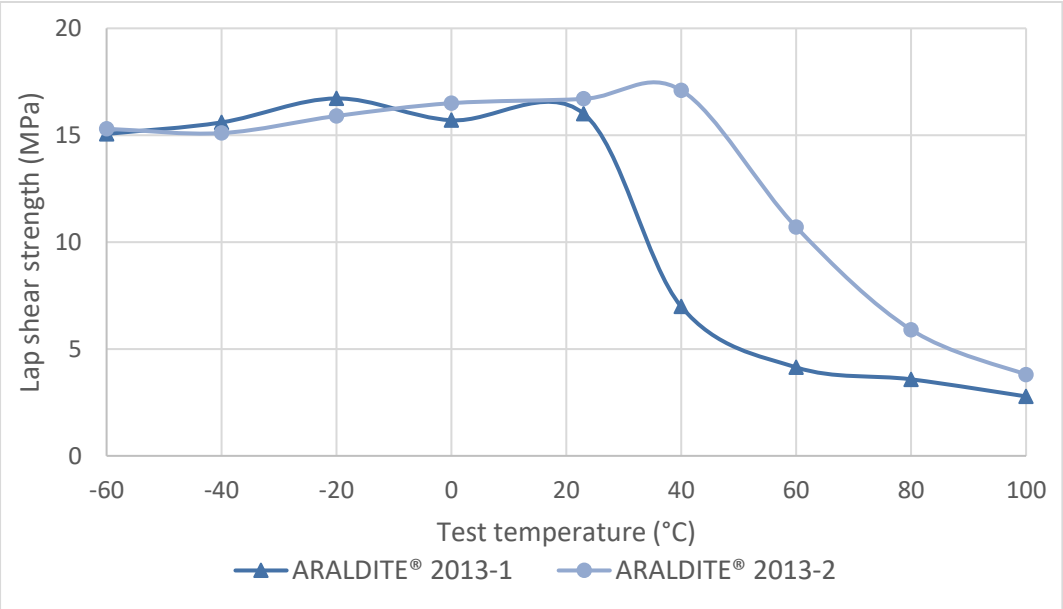


Metal substrates: sandblasted & degreased with acetone

Plastic substrates: abraded & degreased with isopropanol

Lap shear strength versus temperature (ISO 4587)

Cure 16 hours at 40°C



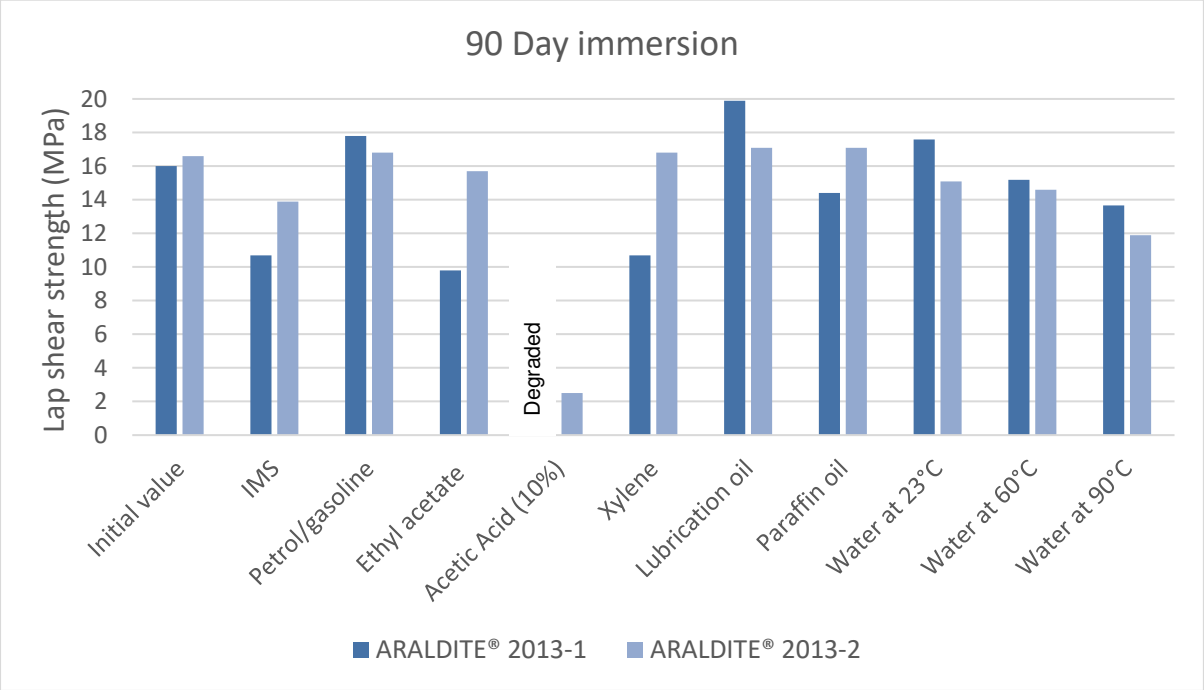
DMA measurement (ISO 6721)

Cure 16 hours at 40°C

	ARALDITE® 2013-1	ARALDITE® 2013-2
Tg (Tanδ)	67°C	64°C
Shear modulus (23°C)	980	1228

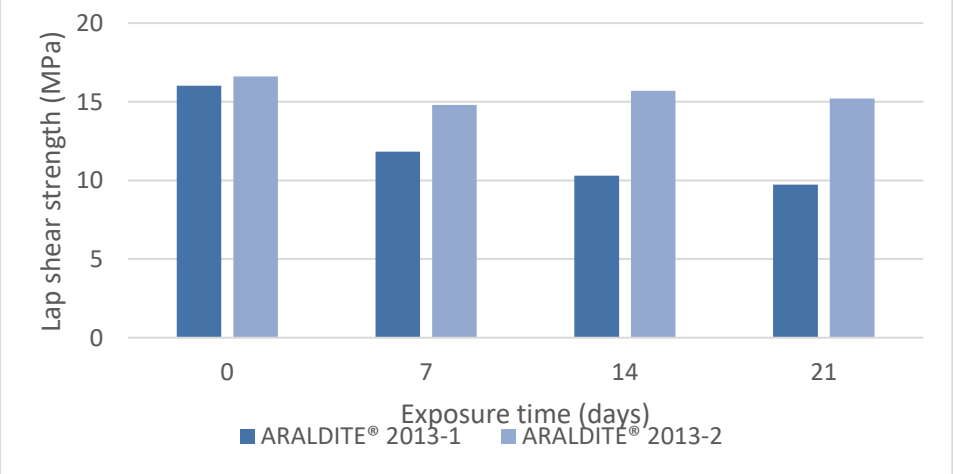
Chemical aging - immersion in different media

Cure 16 hours at 40°C, tested at 23°C



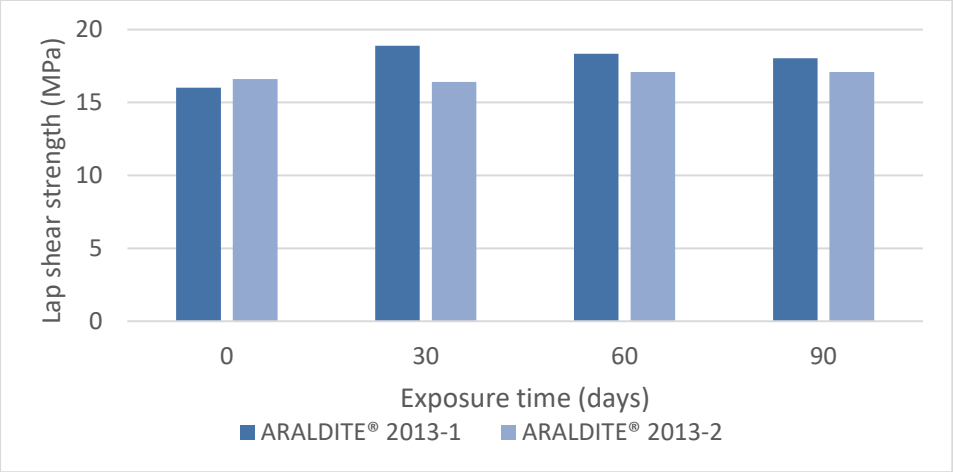
Cataplasma aging (ISO 9142 E2)

Cure 16 hours at 40°C, tested at 23°C



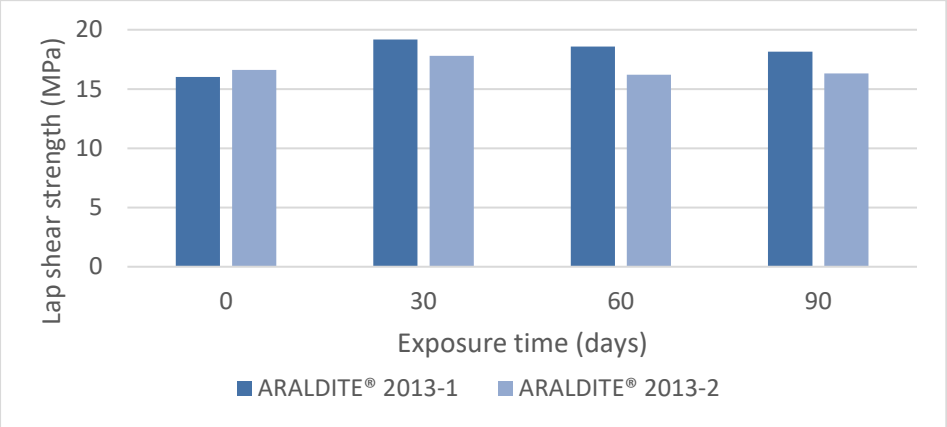
Heat aging at 70°C

Cure 16 hours at 40°C, tested at 23°C



Tropical weathering (40°C / 92% relative humidity)

Cure 16 hours at 40°C, tested at 23°C



Tensile properties (ISO 527)

Cure 16 hours at 40°C, tested at 23°C

	Tensile modulus (MPa)	Tensile strength (MPa)	Elongation at break (%)
ARALDITE® 2013-1	2051	29.7	3.6
ARALDITE® 2013-2	2578	36.1	2.6

CONCLUSION

Testing indicates that the ARALDITE® 2013-2 offers similar handling and properties to the ARALDITE® 2013-1. For many applications, it may be possible to replace the ARALDITE® 2013-1 with ARALDITE® 2013-2 without a change of process conditions or part design. However, it is always recommended to check the suitability of the product for the intended application.

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