

Edwards Analytical
 Units 7 & 14, Evans Business Centre,
 Durham Way South, Aycliffe Business Park,
 Co. Durham, DL5 6ZF

MATERIAL ANALYSIS CERTIFICATE

Apollo Energy



Analysis of Foil Material

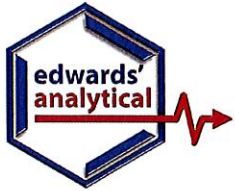
Project Number: 13/EA/12/18

METHOD OF ANALYSIS	Total Thickness, Determination of Pin Holes and Moisture Vapour Permeation Rates
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ANALYSIS RESULT	Pass / Fail
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Edwards Analytical contract laboratory has been inspected in accordance with the Medicines Act by the Medicines and Healthcare Regulatory Agency (MHRA) and is considered to comply with the principles of Good Manufacturing Practice as detailed in Directive 2003/94/EC.

Report Written By		Report Completion Date	05 FEB 2014
Report Authorised By		Authorised Date	05 Feb 2014





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SAMPLE DETAILS	Ecobrite & Thermofoil ES
SAMPLE RECEIPT DATE AND CONDITION	23 Dec 2013

CLIENT CONTACT	Colin Hawkes/ Vicky Espin
CLIENT REFERENCE	Emails between J. Edwards and C. Hawkes

ANALYSIS DETAILS	
Analysis Method(s)	Determination of Pin holes in foil laminates, Total Thickness and Vapour Permeation Rate.
Analysis Performed By	A. C. Lord, C. Talbot
Analysis Completion Date	03 Feb 2014

Report Written By		Report Completion Date	05 FEB 2014
Report Authorised By		Authorised Date	05 Feb 2014



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RESULTS

TOTAL THICKNESS					
Ecobrite			Thermofoil ES		
Max (µm)	Min (µm)	Average Thickness (µm)	Max (µm)	Min (µm)	Average Thickness (µm)
147	136	140.1	135	123	129.4
Stated Specification		Nominal 135µm	Stated Specification		Nominal 145µm

DETERMINATION OF PIN HOLES			
Ecobrite		Thermofoil ES	
Replicate No.	Pin Holes per dcm ²	Replicate No.	Pin Holes per dcm ²
1	ND*	1	ND*
2	ND*	2	ND*
3	ND*	3	ND*
4	ND*	4	ND*
5	ND*	5	ND*

*ND: None Detected

MOISTURE VAPOUR TRANSMISSION RATE ECOBRITE				
Replicate No.	Initial Time Point Weight (g)	Second Time Point Weight (g)	Third Time Point Weight (g)	Weight Change over time
1	102.1705	102.1658	102.1657	-0.0048
2	93.4925	93.4891	93.4910	-0.0015
3	97.8927	97.8931	97.8949	+0.0022
Avg Weight change:				-0.0013(g)

MOISTURE VAPOUR TRANSMISSION RATE THERMOFOIL ES				
Replicate No.	Initial Time Point Weight (g)	Second Time Point Weight (g)	Third Time Point Weight (g)	Weight Change over time
1	98.0451	98.0369	98.0342	-0.0109
2	92.2841	92.2819	92.2834	-0.0007
3	89.3004	89.2959	89.2985	-0.0019
Avg Weight change				-0.0045

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CONCLUSION

The samples of both Ecobrite and Thermofoil demonstrate no moisture vapour transmission over the test period; do not have any detectable pin holes in the samples tested and average total thickness approximate to the nominal thickness stated in the product information documentation.

The Samples of Ecobrite and Thermofoil ES comply with the test criteria and have been compared to the documentation supplied by the client and found to conform to the test specifications detailed within.

The high barrier to water vapour occasioned by the aluminium foil, lack of pinholes etc indicates additionally high barrier to gasses which will include radon.

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