B.T.R. TERMOPLASTICO
BIODEGRADABLE

Subject: Recyclability of Film Containing B . T . R .™

Summary and Conclusion:

The physical properties of HDPE carryu bag films (both wıth and wıthout B . T . R .™) were ınıtıally measured at ambient conditions and then measured after a 24u day accelerated temperature aging protocol that was designed to simulate 6 months of aging under ambient conditions. The physical properties of the PE films that contaıned B . T . R .™ exhıbıted no reduction in tensile strength or elongation after aging compared to the PE film without Ecou One™.

The addıtıon of B . T . R .™ was clearly shown to have no ınfluence on the mechanıcal properties for PE films prior to and after aging. Subsequently, these test results indicate that one can expect no negative effect to the mechanıcal properties of fılms produced wıth recycle content contaınıng the

Testing Protocol:

ASTM has established several guidelines to standardize the accelerated aging of polymer products. One standard guideline is known as F1980u 07, which is based on the Arrhenius equation. Though this guideline is specific to the barrier properties of packaging films for medical devices; its general application to other polymer properties is based on the universal law that the Arrhenius equation represents. The equation is as follows:

$$\mathbf{AAR = Q10^{((AAT\ l\ \ AT)/10)}}$$

where,
AAR : Accelerated Aging Rate
AAT : Accelerated Aging Temperature
AT : Ambient Temperature
Q10 : Accelerated Aging Factor
For the purposes of this study, we will use the following assumptions u

AAT = 50° C (our test conditions)
AT = 23.3° C (assumed ambient temperature conditions)
Q10 = 2.5 (accelerated aging factor)

This gives us an accelerated rate of 8.45. To calculate the testing time required to simulate 6 months, one simply divides the 6 months by the accelerated rate of 8.45. This result is approximately 21 days. So the test protocol results are based on the timeu temperature relationship that Arrhenius discovered in 1903 and has since been applied throughout the physical sciences.

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Test Results:

Sample	Sample Type	Tensile Strength at Yield (PSI)	Tensile Strength at Break	Elongation at Yield (%)	Elongation at Break (%)
Machine Direction Results					
PE film with 1% EG15	Ambient	3400	4690	29	440
PE Film with no B.T.R.™ additive	Ambient	3490	4750	29	445
PE film with 1% EG15	Aged at 50°C for 24 days	3600	5200	29	460
PE Film with no B.T.R.™ additive	Aged at 50°C for 24 days	3400	4620	27	420
Transverse Direction Results					
PE film with 1% EG15	Ambient	3170	3990	7.5	530
PE Film with no B.T.R.™ additive	Ambient	3250	3920	7.2	490
PE film with 1% EG15	Aged at 50°C for 24 days	3210	3850	5.6	470
PE Film with no B.T.R.™ additive	Aged at 50°C for 24 days	3370	3610	6.1	485

The test results for the HDPE films containing B.T.R.™ are statistically equivalent and it can be concluded that there was no difference in mechanical property performance between the ambient and aged samples.

Please don't hesitate to contact me if you have any questions.

Best Regards,

B.T.R. TERMOPLASTICO
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QAC

Quality Alliance Certification

Alianza para tu Certificación

Certificado No. QAC -2020-019/01

QAC, Certificación, S.A. de C.V. certifica que

B.T.R. TERMOPLASTICO BIODEGRADABLE

Ha establecido y mantiene un Sistema de Gestión de la Calidad con base a la Norma

ISO 9001:2015
NMX-CC-9001-IMNC-2015

El alcance de la certificación aplica a

Comercialización y asesoría de productos innovadores biodegradables, como aditivos para la industria del plástico y suplementos alimenticios.

Emisión:	18/12/2020
Vigencia de la certificación	03 años
Expiración:	17/12/2023
Edición No.	01
Organización certificada desde:	18/12/2020

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

ema ORGANISMO DE CERTIFICACIÓN

ACREDITADO 90/13

Dirección técnica

La validez de este certificado esta sujeta a la apropiada aplicación y mantenimiento del Sistema de Gestión de la Organizació n, de conformidad con los requerimientos establecidos en la normativa de referencia. Lo anterior será monitoreado por QAC, Certificación, S.A. de C.V.

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