GEP-SLAP 2022

8 - 12 MAYO | Donostia-San Sebastián, España

El Comité Organizador del Congreso **GEP-SLAP2022** (XVI Reunión del Grupo Especializado de Polímeros – **GEP 2022** y XVII Simposio Latinoamericano de Polímeros - SLAP 2022)

CERTIFICA QUE:

Tamara María Díez Rodríguez

Ha asistido al **Congreso GEP SLAP 2022** celebrado en el Kursaal en Donostia-San Sebastián, del 8 al 12 de mayo de 2022.

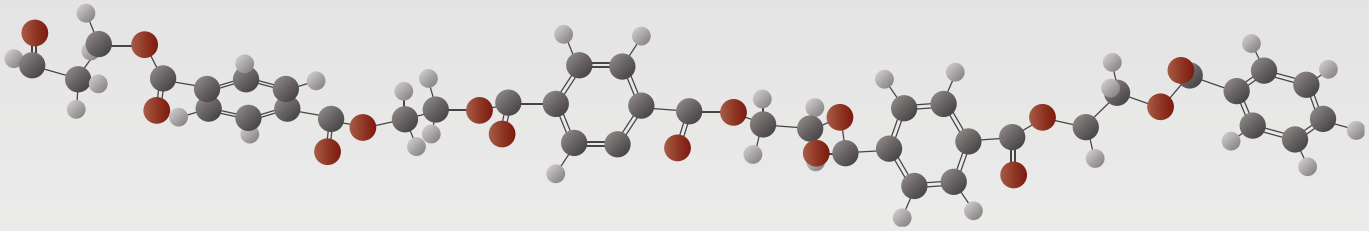
Y para que así conste y surta los efectos oportunos, se expide el presente certificado en Donostia-San Sebastián, el 13 de mayo de 2022.

Alejandro J. Müller
(POLYMAT-UPV/ EHU) Spain

David Mecerreyes
POLYMAT-UPV/ EHU) Spain

Carmen Mijangos
(ICTP-CSIC) Spain

GEP-SLAP 2022



Donostia-San Sebastián

8 - 12 MAYO 2022

8th - 12th MAY 2022

GEP XVI

Reunión del Grupo Especializado de Polímeros GEP de la Real Sociedad Española de Química (RSEQ) y de la Real Sociedad Española de Física (RSEF)

Meeting of the Group Specialized in Polymers of the Spanish Royal Society of Chemistry and Spanish Royal Society of Physics

SLAP XVII

Simposio Latinoamericano de Polímeros

LatinAmerican Polymer Symposium

CIP XV

Congreso Iberoamericano de Polímeros

IberoAmerican Polymer Congress

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O_REC 3 Study of polymer interactions for the eco-design of packaging multilayers | Juan Francisco Vega Borrego (1); Virginia Souza-Egipsy Sánchez (1); Maria Teresa Expósito Espinosa (2); Javier Ramos Díaz (1); Javier Martínez-Salazar Bascuñana (1) | (1) Instituto de Estructura de la Materia (CSIC), (2) Universidad Rey Juan Carlos

O_REC 4 Incorporation of degradable Crosslinkers into Waterborne Pressure Sensitive Adhesives: Towards removable Adhesives | Miren Aguirre (1); Fabian Wenzel (1); Jose R. Leiza (1) | (1) POLYMAT, Euskal Herriko Unibertsitatea UPV/EHU

O_REC 5 Influence of composition and processing conditions on malt-sprout based bioplastics obtained by injection moulding | Alberto Romero (1); María Alonso-González (1,2); Víctor Pérez-Puyana (1); Pablo Sánchez-Cid (1); Manuel Félix (2) | (1) Departamento de Ingeniería Química, Facultad de Química, Universidad de Sevilla, (Spain), (2) Departamento de Ingeniería Química, Escuela Politécnica Superior, Universidad de Sevilla, (Spain)

O_REC 6 Optimization of the preparation conditions of vegetable waste-derived bioplastics intended for agricultural applications | Danila Merino (1); Roberto Simonutti (2); Giovanni Perotto (1); Athanassia Athanassiou (1) | (1) Istituto Italiano di Tecnologia, (2) Università di Milano-Bicocca

O_REC 7 GLYCOLYSIS OF ADVANCED POLYURETHANES COMPOSITES CONTAINING STYRENE- ACRYLONITRILE AND CALCIUM CARBONATE AS FILLERS | Jesús del Amo León (1); Ana María Borreguero Simón (1); Juan Francisco Rodríguez Romero (1) | (1) Instituto de Tecnología Química y Medioambiental (ITQUIMA), UCLM

O_REC 8 Coal tar residues as precursors of hypercrosslinked polymers: using mechanosynthesis as a green synthesis protocol | Antonio M. Borrero-López (1); Jimena Castro-Gutiérrez (1); Alain Celzard (1); Vanessa Fierro (1) | (1) Institut Jean Lamour (IJL), Université de Lorraine, CNRS,Epinal, France

O_REC 9 Catalyst-free transesterification vitrimers: the remarkable activating effect of Fluorine | Vincent Ladmiral (1); Florian Cuminet (1,2); Dimitri Berne (1); Sébastien Lemouzy (1); Christine Joly-Duhamel (1); Eric Dantras (2); Eric Leclerc (1); Sylvain Caillol (1); Rinaldo Poli (3) | (1) ICGM, (2) CIRIMAT, (3) LCC

O_REC 10 Effect of natural fibers on degradation of polylactic acid biocomposites | Libera Vitiello (1); Martina Salzano de Luna (1); Giovanni Filippone (1) | (1) Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università di Napoli Federico II, Naples (Italy)

O_REC 11 Recycling metallocene isotactic polypropylene: the effect of antioxidants incorporation | Enrique Blázquez-Blázquez (1); Tamara M. Díez-Rodríguez (1); Ernesto Pérez (1); María L. Cerrada (1) | (1) Instituto de Ciencia y Tecnología de Polímeros (ICTP-CSIC)

O_REC 12 Aluminium complexes as active catalysts for the homo and co-polymerization of terpene epoxides in batch and REX conditions | Marta Elena Gonzalez Mosquera (1); Valentina Sessini (1); Miguel Palenzuela (1); Christian Rentero (1); Jesus Damian (1); Belen Monje (2); Carolina Acosta (2); Begoña Galindo (2); Miguel Ángel Valera (2) | (1) Universidad de Alcala, (2) Aimplas

O_REC 13 Thermal and mechanical characterization of composite material Epoxy-rubber recycled tire | Alneira Cuellar Burgos (1,2,3); Cristian Alejandro Garcia Acosta (1,2,3); Fabio Augusto Mesa Rueda (1,2,3) | (1) Universidad Nacional de Colombia, (2) Laboratorio de Polímeros y Materiales Compuestos, (3) Departamento de Ingeniería Química

O_REC 14 Study of the crosslinking of wall materials in the microencapsulation of omega-3 rich oils | Agustín González (1); Paola A. Gimenez (1); Antonela E. Bergesse (1); Nahuel Camacho (1); Pablo D. Ribotta (1); Marcela L. Martinez (1) | (1) Universidad Nacional de Córdoba. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

O_REC 15 Evaluation of the compatibility of PVC/PBAT-PLA blends | Mayka Irina Bautista Betancur (1); Juliana Lasprilla Botero (1); Ricardo Santana Castillo (1) | (1) Proquinal SAS

O_REC 16 Imidazolium-based hypercrosslinked ionic polymer to promote the oxidative esterification of furfural | Elizabeth Rangel Rangel (1); Beatriz Fuerte (1); Marta Iglesias (1); Eva Maya (1) | (1) Instituto de Ciencia de Materiales de Madrid (ICMM), Consejo Superior de Investigaciones Cientificas (CSIC)

O_REC 17 Advanced and traditional processing of thermoplastic polyurethane waste | Tamara Calvo-Correas (1); Miriam Benitez (1); Izaskun Larraza (1); Lorena Ugarte (1); Cristina Peña-Rodríguez (1); Arantxa Eceiza (1) | (1) Universidd del País Vasco/Euskal Herriko Unibertsitatea (UPV/EHU)

O_REC 18 Synthesis of Polyurethanes as high-added value products from Chemical Upcycling of PET waste | María Dolores de Dios Caputto (1); Rodrigo Navarro Crespo (1); Alejandra Rubio (1); Ángel Marcos-Fernández (1) | (1) ICTP-CSIC

O_REC 19 Composites Based on Poly(Lactic Acid) (PLA) and SBA-15: Effect of Mesoporous Silica on Isothermal Crystallization from Either Glass or Molten State | Tamara María Díez Rodríguez (1); Enrique Blázquez Blázquez (1); Ernesto Pérez Tabernero (1); María Luisa Cerrada García (1) | (1) Instituto de Ciencia y Tecnología de Polímeros (ICTP-CSIC)

O_REC 20 Towards industrial use of PHA: performance and end of life | Luis Cabedo (1); Patricia Feijoo (1); Kerly Samaniego-Aguilar (1); Anna Marín (1); Estefanía Sánchez-Safont (1); Alex Arrillaga (2); Jon Anakabe (2); José Tena (3); José García-March (3); Sergio Torres-Giner (4); José María Lagarón (4); José Gámez-Pérez (1) | (1) Universitat Jaume I, (2) Leartiker S.Coop, (3) Universidad Católica de Valencia, (4) IATA-CSIC

O_REC 21 Development of a Bio-based High Pressure Laminate (HPL) by Partial Replacement of Phenol with Hardwood Kraft Lignin: Design, Optimization and Scaling-up | Veronica Nicolau (1); Micaela Peralta (1) | (1) GPol, Facultad Regional San Francisco, Universidad Tecnológica Nacional

O_REC 22 Preparation of poly(butylene succinate)-based novel materials: layer-by-layer assembly of biopolyesters and its combination with polysaccharides | Mario Iván Peñas (1,2); Rebeca Hernández (1); Alejandro J. Müller (2,3) | (1) Instituto de Ciencia y Tecnología de Polímeros - Consejo Superior de Investigaciones Científicas (ICTP-CSIC), (2) POLYMAT y Universidad del País Vasco (UPV/EHU), (3) IKERBASQUE

Composites Based on Poly(Lactic Acid) (PLA) and SBA-15: Effect of Mesoporous Silica on Isothermal Crystallization from Either Glass or Molten State.

Tamara M. Díez-Rodríguez [1], Enrique Blázquez-Blázquez [1], Ernesto Pérez [1], María L. Cerrada [1]

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Introduction

Poly(lactic acid) (PLA) possesses several attractive characteristics. Among others, it is obtained from renewable resources, is biodegradable, biocompatible, and semicrystalline. All of these aspects have led to its use in both specific and commodity applications [1,2].

PLA exhibits different crystalline structures: α', α, β, and γ [3-7]. The α' and α crystal forms are, however, the most common polymorphs, showing a remarkable similarity. Even so, the subtle structural differences between the α' and the α phases can lead to dramatic changes in properties. Furthermore, a transformation from the α' to the α form has also been observed and characterized [8].

A relatively low overall nucleation and crystallization rate are detrimental characteristics shown by PLA. Accordingly, numerous investigations are focused on the enhancement of PLA crystallization kinetics [9] by adding nucleants to increase nucleation density or by incorporating plasticizers to boost chain mobility.

Ordered mesoporous silicas can be a suitable alternative as nucleating agents since they can interact with polymeric chains, either from the exterior of the particles or the interior of the empty pores existing in their structures if macromolecules are able to be included in that nanometric space. Santa Barbara Amorphous SBA-15 particles are one of the best-known members. They are constituted by hollow channels arranged in hexagonal ordered frames [10].

The purpose of this research is to incorporate, by extrusion, SBA-15 particles into a PLA matrix, analyzing the effect on its crystallization capability (under dynamic or isothermal conditions), starting from samples of pristine PLA and the different composites which are initially amorphous after processing. Influence of mesoporous silica in the thermal stability and mechanical response is also evaluated.

Experimental

Composites with different contents of SBA-15 particles (1, 3, 6, and 9% in weight, labeled as PLA-SBA1, PLA-SBA3, PLA-SBA6, and PLA-SBA9, respectively) were processed by melt extrusion in a corotating twin-screw micro extruder (Rondol, Rondol Industrie, Nancy, France) at a rate of 60 rpm. Prior to extrusion, both the polymer and SBA-15 were dried. The former was placed in an oven at 100 °C for 20 min, followed by drying under vacuum at 85 °C for 2 h. The SBA-15 particles were dried under vacuum at 100 °C for 24 h. In the extruder, screw temperature profiles of 125, 160, 190, 190 and 185 °C were used from the hopper to the die, with the length-to-diameter ratio being 20:1. Then, films were obtained by compression molding in a hot-plate Collin press (Collin GmbH, Maitenbeth, Germany). The first stage was the maintenance of the material at a temperature of 185 °C and at a pressure of 30 bar for 6 min. After that, a cooling process was applied to the different composites from their molten state to room temperature for 4 min at the relatively fast

rate of around 80 °C/min and at a pressure of 30 bar.

Results and Discussion

Figure 1 shows the isothermal crystallization from the molten state for PLA and PLASBA9 at different temperatures. It is noted that presence of SBA-15 silica exerts an important effect and leads to acceleration of the PLA crystallization independently of the $T_c^{isothermMELT}$ analyzed. Thus, crystallization is shifted to shorter times and is in the PLASBA9 narrower than in the pristine PLA at a given $T_c^{isothermMELT}$. The fastest crystallization temperature for the PLA chains from both specimens is 100 °C [11]. Crystallization times involved, even at the maxima, are very long.

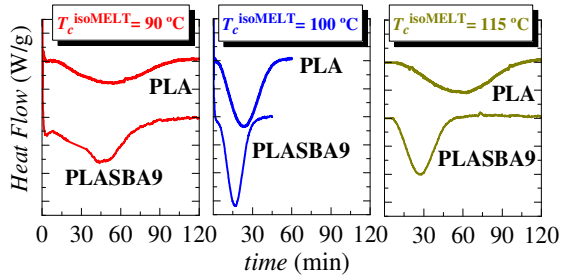

Figure 1. DSC curves for PLA and its composite with SBA-15 isothermally crystallized from the melt at the indicated temperatures.

As mentioned, films of PLA and the different composites are initially fully amorphous, so that their crystallization from the glass turns out mandatory. Figure 2 depicts the differences in the peak crystallization times as a function $T_c^{isotherm}$ when crystallization was initiated from either the molten or glassy states.

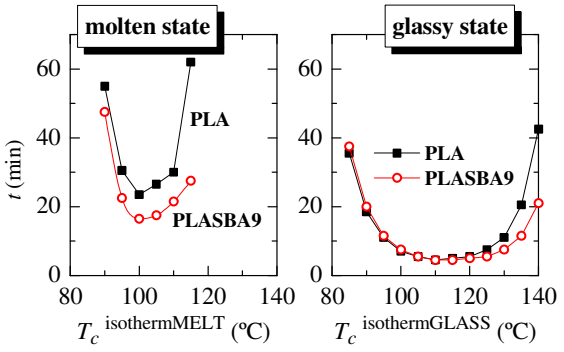

Figure 2. Dependence of peak crystallization time on crystallization temperature in PLA and PLA-SBA9 from either the molten or the glassy states.

Summarizing, an important nucleation effect of the silica in the PLA has been found in isothermal experiments, either from the melt or from the glassy state (and also under dynamic conditions). Isothermal crystallization from the glass is considerably faster than from the molten state, with peak crystallization times around 4-5 times shorter in the former. These high differences are also responsible for the fact that the nucleating effect of mesoporous SBA-15 becomes more considerable when crystallization is initiated from the melt. Some interesting features related to the polymorphs developed have been also found.

References

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Miércoles 11 | Wednesday 11th

8:00-9:00	REGISTRO GEP-SLAP 2022 | Registration			
9:00-9:45	PLENARIO | PLENARY KUMAR			
	SESIÓN 1 | SESSION 1 Salas | Rooms **1+2**	**SESIÓN 2 | SESSION 2** Salas | Rooms **4+5**	**SESIÓN 3 (INDUSTRIA) | SESSION 3** Sala | Room **3**	
9:55-10:25	**KN STINGELIN**	**KN MANCHADO**	9:55-10:25	**INV TOMAS**
10:25-10:45	**INV RIBEIRO**	**INV ALTSTADT**	10:25-10:45	**INV LAGARON**
10:45-11:00	EST6 - Aranguren	REC9 - Ladmiral	10:45-11:05	**INV NIETO**
11:00-11:30	Café | Coffee Break			
11:30-11:50	**INV FILIPPONE**	**INV ALVAREZ**	11:30-11:50	**INV ELIZETXEA**
11:50-12:05	EST7 - Gracia Fernández	REC10 - Vitiello	11:50-12:10	**INV DEL AGUA**
12:05-12:20	REO8 - Fdz Blázquez	REC11 - Blázquez	12:10-12:30	**INV DUPIN**
12:20-12:35	REO9 - Rubio	REC12 - Mosquera	12:30-12:50	**INV CORONA**
12:35-12:50	REO10 - Molina	REC13 - Cuellar	12:50-13:10	**INV NUÑEZ**
12:50-13:05	REO11 - Calafel	REC14 - A. González		
13:10-15:00	FOTO CONGRESO | CONFERENCE PHOTO + COMIDA | LUNCH			
15:00-15:30	**KN GUERRERO**	**KN PETZHOLD**	15:00-15:20	**INV MONJE**
			15:20-15:40	**INV ASUETA**
15:30-15:45	REO12 - Urbano	REC15 - Bautista	15:40-15:55	EU_IND5 - Jehanno
15:45-16:00	REO13 - Fdz San Martín	REC16 - Rangel	15:55-16:10	EU_IND6 - Osorio
16:00-16:15	REO14 - Haeberle	REC17 - Calvo-Calvo	16:10-16:25	EU_IND7 - Lacruz
16:15-16:30	REO15 - Aguilar-Bolados	REC18 - de Dios Caputto	16:25-16:40	EU_IND8 - Germán
16:30-16:45	REO16 - Sanz de León	REC19 - Díez Rodríguez	16:40-16:55	EU_IND9 - Guissi
16:45-18:45	REUNION GEP Salas 1+2 | MEETING GEP Rooms 1+2			
20:30-22:30	CENA DEL CONGRESO | CONFERENCE DINNER			