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Polylactic acid, maleic anhydride and dicumyl peroxide: NMR study of the free-radical melt reaction product

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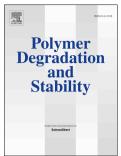
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## ACCEPTED MANUSCRIPT

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10	
11	Abstract
12	In this study, a detailed characterization was carried out of a product formed in the
13	melt reaction of poly(lactic acid) PLA with maleic anhydride, initiated by dicumyl
14	peroxide under the reaction conditions reported herein. The chemical structure of the
15	reaction product was determined by <sup>1</sup> H-NMR and <sup>13</sup> C-NMR spectroscopy and by
16	DEPT-135 and <sup>13</sup> C- <sup>1</sup> H HSQC techniques. It was found that, under the conditions
17	applied in this study, instead of the well-reported grafting of maleic anhydride onto the
18	PLA, a product was formed from the reaction of two PLA macro-radicals, which
19	probably occurs after the $\beta$ -scission mechanism. The $^{13}\text{C-NMR}$ spectrum of the
20	proposed reaction product was also calculated using the GIAO-DFT method and the
21	result is in agreement with the experimental spectrum.
22	Keywords: Polymer grafting, grafted PLA, chemical modification
23	Introduction
24	The chemical modification of polymers by means of grafting is an interesting
25	way to adjust the physical-chemical properties of polymeric materials for specific
26	applications. Polymer grafting has been employed for different purposes, for example,
27	to improve the compatibility between components in blends and composites [1-3]. In

this regard, maleic anhydride (MA) is one of the most commonly used compounds,

since it can be easily grafted onto polyolefins and polyesters in the presence of a

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