XXII Encontro Luso-Galego

Química

9 a 11 novembro 2016

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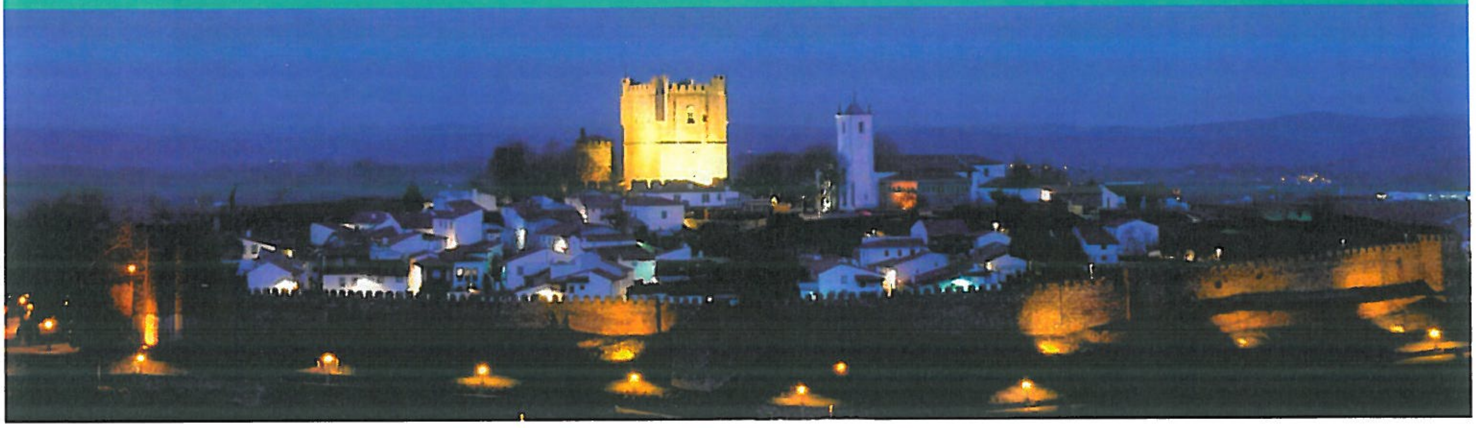

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PROGRAMA CIENTÍFICO

9 de novembro (quarta-feira)			
9:00 – 11:30	Entrega de Documentação e Afixação de Painéis		
11:30 – 12:00	Sessão de Abertura		
12:00 – 13:00	**Sala Bragança**		
	Lição Plenária 1 - Mario G. Ferruzzi		
Pausa para almoço (livre)			
15:00 – 16:00	**Sala Bragança**		
	Lição Plenária 2 - Francisco Guitián		
16:00 – 17:00	Comunicações Orais S1		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QAMA1	BB1	QV1
	QAMA2	QS1	QV2
	QAMA3	BB2	QV3
	QAMA4	QS2	QV4
17:00 – 17:45	Café e Discussão de Painéis S1 (QAMA)		
17:45 – 19:00	Comunicações Orais S2		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QAMB1	CAT1	QP1
	QAMB2	CAT2	QP2
	QAMB3	CAT3	QP3
	QAMB4	CAT4	EEQ1
	QAMB5	CAT5	EEQ2
19:30	Receção de São Martinho		

10 de novembro (quinta-feira)			
9:00 – 10:00	**Sala Bragança**		
	Lição Plenária 3 - João F. Mano		
10:00 – 11:00	Comunicações Orais S3		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QS3	QAMA5	QAMB6
	QS4	QAMA6	QAMB7
	QS5	QAMA7	QAMB8
	QS6	QAMA8	QAMB9
11:00 – 11:45	Café e Discussão de Painéis S2 (EEQ, QP, QAMB, QS)		
11:45 – 13:15	Comunicações Orais S4		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QF1	QAMA9	NN1
	QIE1	QAMA10	NN2
	QF2	QAMA11	NN3
	QF3	QAMA12	NN4
	QF4	QAMA13	NN5
	QIE2	QAMA14	NN6
Pausa para almoço (livre)			
15:15 – 16:15	**Sala Bragança**		
	Lição Plenária 4 - Diego Moldes		
16:15 – 17:15	Comunicações Orais S5		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QV5	QO1	QAMA15
	QV6	QO2	QAMA16
	QV7	QO3	QAMA17
	QA1	QO4	QAMA18
17:15 – 18:00	Café e Discussão de Painéis S3 (CAT, NN, QIE, QI, QO, QV)		
18:00 – 19:00	Comunicações Orais S6		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	CAT6	QA2	QI1
	CAT7	QA3	QO5
	CAT8	QA4	QO6
	CAT9	QA5	QI2
20:00	Jantar do Encontro		

11 de novembro (sexta-feira)			
9:30 – 10:30	**Sala Bragança**		
	Lição Plenária 5 - João G. Crespo		
10:30 – 11:30	Comunicações Orais S7		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QF5	QAMA19	QV8
	QF6	QAMA20	QV9
	QF7	QAMA21	QV10
	QIE3	QAMA22	QV11
11:30 – 12:15	Café e Discussão de Painéis S4 (BB, QA, QF)		
12:15 – 13:15	Comunicações Orais S8		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QAMA23	QAMB10	BB3
	QAMA24	QAMB11	QS7
	QAMA25	QAMB12	BB4
	QAMA26	QAMB13	BB5
Pausa para almoço (livre)			
15:15 – 16:15	Comunicações Orais S9		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QAMA27	QS8	QF8
	QAMA28	BB6	QIE4
	QAMA29	QS9	QF9
	QAMA30	BB7	QIE5
16:15 – 16:45	Café		
16:45 – 17:45	Comunicações Orais S10		
	Sala Bragança	**Sala Porto**	**Sala Vigo**
	QAMA31	QIE6	QA6
	QAMA32	QIE7	QA7
	QAMA33	QIE8	QA8
	QAMA34	QIE9	QA9
17:45 – 18:00	Sessão de Encerramento		

Development of amino resin with flexible performance

A. Antunes[1,*], J. Pereira[2,5], N. T. Paiva[1], J. M. Ferra[1], J. Martins[3,5], L. Carvalho[3,5], A. Barros-Timmons[4], F. D. Magalhães[5]
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Amino-formaldehyde resins are thermosetting polymers. They are divided into three main types: urea formaldehyde (UF), melamine formaldehyde (MF) and melamine urea formaldehyde (MUF). These resins are characterized, after cure, by high crosslink density, high stiffness and high tensile strength [1]. However, this stiffness may be undesirable when a final product with some flexibility is desired.

Cork agglomerates are cork-based products that can be used for surfacing, flooring and insulation purposes. They are composed of cork granules with variable dimensions, bound together by rubber, polyurethane adhesive or MUF resin [2]. Cork agglomerates can be sold as flat panels or as a rolled panels (so called "cork roll"). MUF resins cannot be used for the latter form, since its stiffness causes the material to crack when flexed.

The aim of this work is to develop an amino resin with high flexibility, enough to allow its use in cork roll production. Good adhesive properties, hydrolysis resistance and low formaldehyde emissions are also key features. The strategy applied to address this challenge consists in the modification of the MUF resin with the incorporation of long and linear chain compounds that act as flexible segments in the MUF structure. Glycols with different molecular weights were used for this purpose.

The results show different performance for glycols with different molecular weights. Namely, the adhesive properties decrease with increasing molecular weight. The glycol with molecular weight of 200 g/mol yielded a promising formaldehyde-based flexible adhesive polymer.

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Preparation of amino resins and their impact on the production of wood-based panels

C. Gonçalves[1,*], J. Pereira[1,2], N. T. Paiva[3], J. M. Ferra[3], J. Martins[1,4], F. Magalhães[1], A. Barros-Timmons[5], L. Carvalho[1,4]
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In the last decades, the industry of wood products is going through a great evolution thanks to companies like Sonae Arauco, which focus has been on developing more and better wood-based products. In 2015 Portugal produced 1 million and three hundred thousand m^3 and exported 278 million euros of wood-based panels [1]. Among these products, the best known are the commercially available particleboard (PB), medium density fibreboard (MDF), oriented strand board (OSB) and plywood (PW). For all these types of panels the use of a synthetic adhesive is required. Among the wide range of adhesives/resins employed in the wood industry, the most important are the amino resins which include urea-formaldehyde (UF) resins, melamine-formaldehyde (MF) resins and melamine-urea-formaldehyde (MUF) resins.

The aim of this work is to optimize the amino resins (UF and MUF) synthesis process by assessing the impact on the final characteristics of wood-based panels (PB and MDF). To understand how the operating conditions influence the final product properties, different tests will be performed. Tools for design of experiments (DoE) will be used for planning experiments and data processing. The purpose is to correlate the conditions of the laboratorial reactor and the main properties of resins (molecular weight distribution, degree of branching, condensing structures and reactivity) and thereafter with some of the final product properties (physical-mechanical performance and formaldehyde emissions). In a second step, using the most promising formulations, other factors related to the sizing process (wood moisture content, resin content) and pressing (temperature, pressing cycle) will also be considered.

At an early stage, different variables related to resins synthesis were studied, trying to better understand their impact on wood-based panels properties, in particular particleboards. In an initial approach, an industrial UF resin was synthesized at different values of pH, temperature, and final viscosity. The resins were characterized using empirical quality control methods and advanced physicochemical characterization techniques. The panels produced were characterized using standard tests. The results are being analysed using the JMP Statistical Software.

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Greener urea-formaldehyde resins for the production of particleboards

A. M. Ferreira[1,*], F. D. Magalhães[1], J. Ferra[2], J. Martins[1,3], L. H. Carvalho[1,3], N. Paiva[2]
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Urea-formaldehyde resins (UF) are the most used adhesives for the production of wood based panels [1]. Their high reactivity, good binding strength and low cost are the main reasons for their heavy use [2]. However, this type of resin presents some problems due to the emissions of formaldehyde, as it is a chemical compound classified as a human carcinogen [3] and also, because it is obtained from fossil fuels.

There are increasing concerns about the environment, and the populations health, which creates a strong demand for eco-friendly products, such as natural wood adhesives.

The goals of the research project, is to develop a greener urea-formaldehyde resin for the production of particleboards, with the incorporation of at least 30% of a natural compound. In a first approach to accomplish this goal, the incorporation of lignin in the UF resin was envisaged. Lignin is the principal byproduct of the pulp industry. In order to increase lignin reactivity, it was first hydroxymethylated. It is expected that the added reactive hydroxyl groups allow its incorporation in the urea-formaldehyde polymer.

So far, it was possible to incorporate 20% of hydroxymethylated lignin, percentage by mass, in the urea-formaldehyde adhesive.

Three-layer particleboards, 16 mm thick, were manufactured with this adhesive (amount of solid resin 6.5, in the face, and 6.1, in the core layers, based on the weight of the oven-dried particles). Boards were pressed in a laboratory hot-press controlled by computer at 190 °C and at several pressing times, from 3 to 6 min, and then tested for several physical-mechanical properties. They presented an internal bond strength in the range of 0.44-0.50 $N.mm^{-2}$ which are above the requirements of the standard EN 312 for standard particleboards type P2 (0.35 $N{\cdot}mm^{-2}$).

Finally, the future work will focus on a stepwise increase of the lignin content in the UF resin; optimization of the hydroxymethylation process; and reconsider lignin, on its own, as an adhesive for particleboards.

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