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COMPARATIVE STUDIES OF LATEX OBTAINED OF RUBBER TREE CLONES (*Hevea brasiliensis*) - SERIES IAC 328 – VOTUPORANGA - SP

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Abstract

Membranes of latex extracted of the seringueira tree (*Hevea brasiliensis*), genetically improved by selection and statistics methods, were prepared by air drying a 10 mL suspension of the ammonia in latex 10% (*v*/*v*). TG-DTG and DSC curves were used to characterize the membranes. Thermal stability and thermal decomposition of these compounds were analyzed. The results obtained show no differences among latex from different clones.

Keywords: clone, genetic improvement, latex, thermal stability

Introduction

Rubber tree improvement [*Hevea brasiliensis* (Willd ex Adr. de Juss.) Müell. Arg.] is an essential market species due to its wide use in industry. The main cultivation sites in Brazil, are known as 'escape areas'. The plateau region of the state of São Paulo is the most important rubber-producing area in the country [1].

The main goal of the genetic improvement of the *Hevea brasiliensis* productive trees is to obtain more resistant species and to attain harder and more productive trees. This has been achieved with great success, by researchers of the Campinas Agronomic Institute (IAC – Campinas, Brazil) [2–4].

Experimental plantations of three IAC clones and two Asiatic clones were used in the study of the physical and chemical characteristics of the latex products. Charac-

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terization of the quality of latex is important for quantitative evaluation of rubber production [5–7].

Experiment method

Latex was extracted from ten trees of each of five seringueira clones (*Hevea brasiliensis*). 10 mL of concentrated ammonia, were added to 100 mL of latex to avoid the coagulation during the transport [8, 9]. Membranes of latex were prepared by drying the ammonia solution with an air stream [10].

TG-DTG and DSC curves of the membranes of latex of clones: IAC-328, IAC-329, IAC-330 and the matrix references GT 1 and RRIM 600, were obtained using a Shimadzu thermoanalyser system, model TGA-50, with continuous synthetic air flow at a rate of 100 mL min^{-1}, sample mass among 6 and 15 mg, in alumina crucible without cover, a heating rate of 10°C min^{-1}, scanning for TG curves up to 900°C and up to 650°C for DSC curves.

Results and discussion

Table 1 presents temperature ranges, mass losses, attribution and mass of residue for all latex membranes studied. TG and DTG curves are shown in Figs 1 to 4.

Table 1 Thermal stability and mass loss

Clones/Locations	Temp. range/°C	Mass loss/%	Attribution	Residue/%
GT1/ Pindorama	27–199	2.029	volatile	2.560
	199–542	95.407	thermal decomposition	
GT1/ Votuporanga	27–210	1.919	volatile	0.541
	210–553	97.540	thermal decomposition	
RRIM 600/ Pindorama	27–196	1.659	volatile	0.528
	196–552	97.813	thermal decomposition	
RRIM 600/ Votuporanga	27–228	1.217	volatile	0.113
	228–539	98.671	thermal decomposition	
IAC 328/ Votuporanga	27–207	2.273	volatile	0.517
	207–536	97.210	thermal decomposition	
IAC 329/ Votuporanga	27–209	2.261	volatile	0.476
	209–570	97.223	thermal decomposition	
IAC 330/ Votuporanga	27–200	1.433	volatile	1.302
	200–540	96.935	thermal decomposition	

All the membranes lost mass in three consecutive steps, beginning at temperatures between 193 and 209ºC, with TG and DTG curves showing great similarities, suggest-

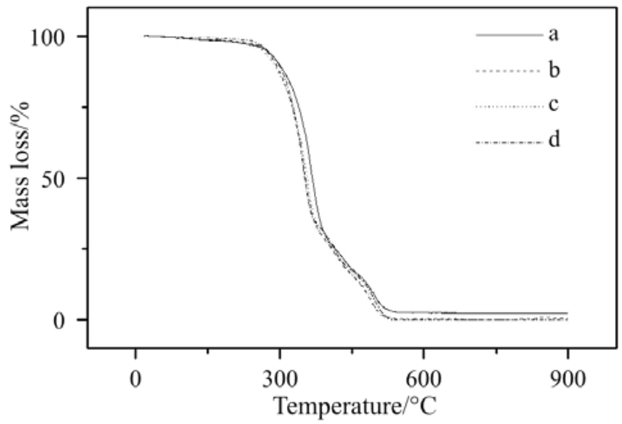

Fig. 1 TG curves of: a – GT1-Pindorama, b – GT1-Votuporanga, c – RRIM-600-Pindorama and d – RRIM 600-Votuporanga

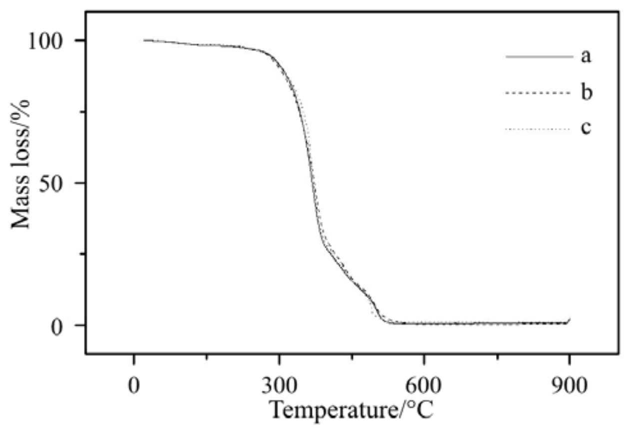

Fig. 2 TG curves of: a – IAC 328, b – IAC 329 and c – IAC 330

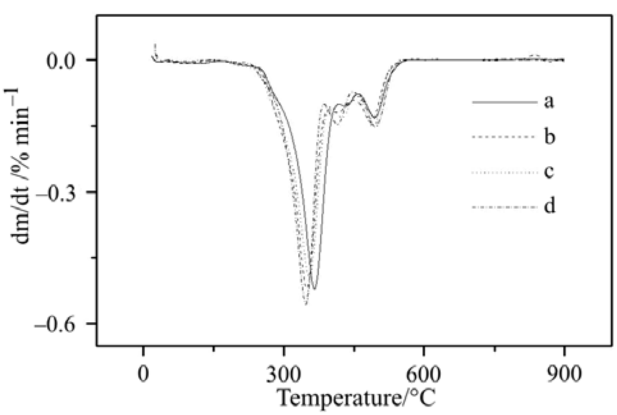

Fig. 3 DTG curves of: a – GT1-Pindorama, b – GT1-Votuporanga, c – RRIM-600-Pindorama and d – RRIM-600-Votuporanga

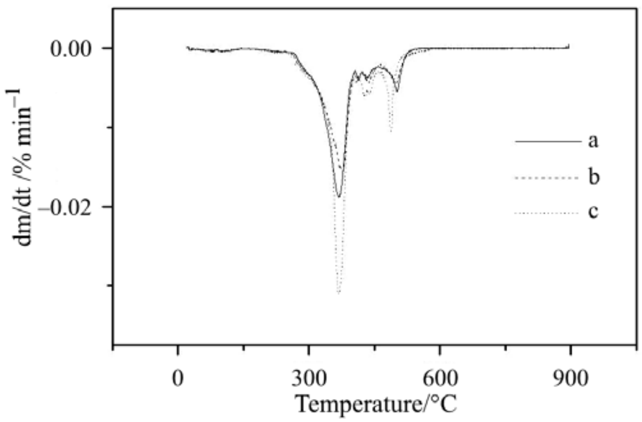

Fig. 4 DTG curves of: a – IAC 328, b – IAC 329 and c – IAC 330

ing that the decomposition mechanism is the same. The end of thermal decomposition occurs at temperatures up to 570ºC. The residues are probably ashes [11] or impurities, which were added during the extraction process of the latex in the plantations.

Latex from the GT1 and RRIM 600 Asiatic clones (Figs 1 and 3) grown in Pindorama and Votuporanga and IAC-328, IAC-329, IAC-330 clones (Figs 2 and 4) grown in Votuporanga, exhibited an initial small mass loss attributed to elimination of the volatile compounds, probably ammonia residue [11], followed by three consecutive mass loss, attributed to the thermal decomposition of the membrane.

Table 2 presents temperature ranges, temperature of maximum peak and heat from the DSC curves.

Table 2 Temperatures ranges, temperature of maximum peak and heat

Clones/Locations	Broad exotherm			Exothermic peak		
	Temp. range/°C	Temp. max./°C	Heat/ kJ g^{-1}	Temp. range/°C	Temp. max./°C	Heat/ kJ g^{-1}
GT1/Pindorama	228–404	357.43	1.44	404–554	491.05	3.12
GT1/Votuporanga	215–398	357.95	1.77	398–359	485.86	3.14
RRIM 600/Pindorama	222–400	348.69	1.58	400–559	488.31	2.96
RRIM 600/Votuporanga	217–374	335.16	1.11	374–567	484.48	2.27
IAC 328/Votuporanga	235–388	352.21	1.12	410–551	499.94	3.36
IAC 329/Votuporanga	229–400	370.88	1.25	425–535	485.09	2.95
IAC 330/Votuporanga	230–402	386.49	0.970	411–562	478.05	2.49

For the GT1 and RRIM 600 clone (Fig. 5) and the samples IAC-328 (a), IAC-329 (b) and IAC-330 (c) (Fig. 6), the DSC curves exhibited a broad exotherm corresponded the first steps of thermal decomposition, followed by an exothermic peak attrib-

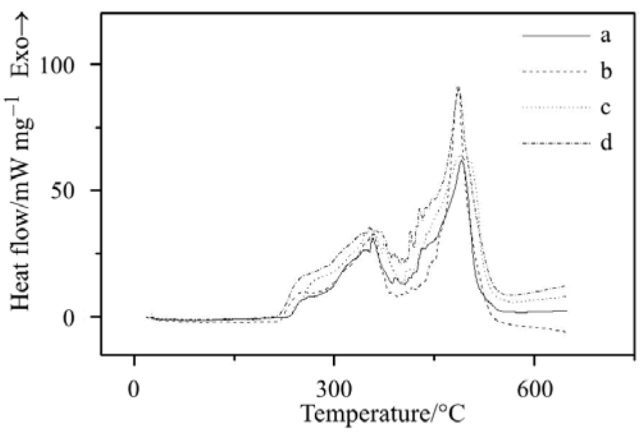

Fig. 5 DSC curves of: a – GT1-Pindorama, b – GT1-Votuporanga, c – RRIM-600-Pindorama and d – RRIM-600-Votuporanga

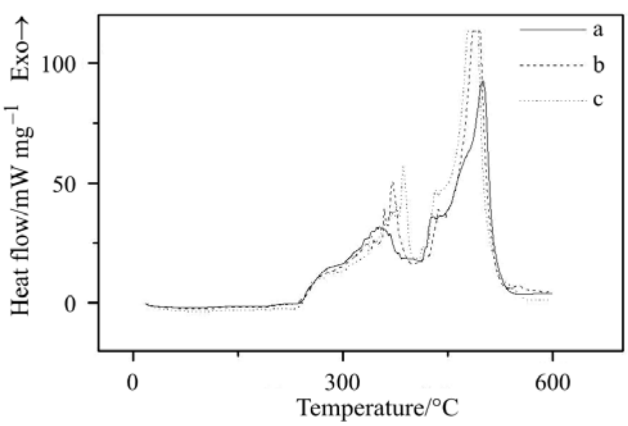

Fig. 6 DSC curves of: a – IAC-328, b – IAC-329 and c – IAC-330

uted the second and the third steps of the process of the thermal decomposition of membrane, which are all in accordance with the mass losses of the TG and DTG curves.

Concluding remarks

TG-DTG and DSC data for membranes show that latex from clones of series IAC have similar thermal stability to that observed for latex from clones of Asian origin. The same behavior is also observed during thermal decomposition. These information contribute to the establishment of standard of relative quality for these clones.

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