energies

MDPI

Article

Valorization of *Prosopis juliflora* Woody Biomass in Northeast Brazilian through Dry Torrefaction

José Airton de Mattos Carneiro-Junior [1], Giulyane Felix de Oliveira [2], Carine Tondo Alves [3], Heloysa Martins Carvalho Andrade [2,4], Silvio Alexandre Beisl Vieira de Melo [4,5] and Ednildo Andrade Torres [4,5,*]

[1] Department of Biofuels, Federal Institute of Education, Science and Technology of Bahia, 44.900-000 Irecê-BA, Brazil; airton@ifba.edu.br
[2] Department of Inorganic Chemistry, Federal University of Bahia, 40.170-115 Salvador-BA, Brazil; giulyanefelix@hotmail.com (G.F.d.O.); handrade@ufba.br (H.M.C.A.)
[3] Department of Energy Engineering, Federal University of the Reconcavo of Bahia, 44085-132 Feira de Santana-BA, Brazil; carine.alves@ufrb.edu.br
[4] Interdisciplinary Center in Energy and Environment, Federal University of Bahia, 40.170-115 Salvador-BA, Brazil; sabvm@ufba.br
[5] Industrial Engineering Program, Federal University of Bahia, 40210-630 Salvador-BA, Brazil; sabvm@ufba.br
* Correspondence: ednildotorres@gmail.com

Supplementary Materials

Table S1. Physicochemical characterization of biomass.

Biomass	Proximate analysis				Ultimate analysis[b]					
	MC[a]	VM[b]	Ash[b]	FC[b]	C	H	N	O	S	HHV[c]
PJ105	6.1 ± 0.2	78.68 ± 0.7	2.87 ± 0.13	12.35 ± 0.5	46.30	7.49	0.25	42.99	0.10	18.33 ± 0.10
PJ230	0.3 ± 0.02	74.92 ± 0.6	3.25 ± 0.05	21.53 ± 0.2	53.84	6.45	0.24	36.21	0.01	20.01 ± 0.08
PJ270	0.1 ± 0.03	72.64 ± 0.4	3.97 ± 0.03	23.29 ± 0.2	61.24	5.64	0.10	29.04	<0.01	21.14 ± 0.10
PJ310	0.0 ± 0.03	67.93 ± 0.4	4.41 ± 0.03	27.66 ± 0.1	63.65	5.23	0.08	26.62	<0.01	23.05 ± 0.06
Prosopis[1]	7.9–12.0	62.7–77.5	0.5–4.6	16.8–24.8	43.3–48.5	5.9–8.1	1.4–1.9	42.5–48.0	0.06–0.18	16.8–21.4
Eucalyptus[2]	2.3–11.6	63.4–84.2	0.4–6.1	13.9–24.5	41.4–47.2	5.0–8.1	0.02–1.6	44.9–51.9	0.06–0.5	13.2–18.7
Pinus[3]	2.4–7.6	78.3–87.8	0.2–4.4	11.8–12.7	47.3–47.9	5.7–6.5	0.1–0.2	42.3–44.9	0.03–0.5	19.4–20.0
Peat[4]	10.0–55.0[a]	50.0–80.0	2.0–7.0	4.0–30.0	52.0–56.0	5.0–6.5	0.8–3.0	30–40	0.05–0.3	17.3–26.3
Coal[4]	6.0–10.0[a]	15.0–45.0	3.0–12.0	45.0–85.0	46.0–87.0	3.5–5.0	0.8–1.5	2.8–11.3	0.7–4.0	24.4–32.6

Note: M: Moisture; VM: Volatile Material; FC: Fixed Carbon; HHV: Higher Heating Value.
[a] (weight %, dry basis); [b] (weight %); [c] (MJ/kg).

[1] Ranges derived from comparison of wood/wood material properties reported in different studies with the wet and dry biomass [18,22,38,39,41–43].
[2] It is composed with parts of the wood *E. globulus, E. grandis* and *E. nitens* (leaves, wood, bark) [4,8,14,65].
[3] It is composed with Pinus sylvestris reported in the studies by Sajdak, et al. [66]; Álvarez, Nogueiro, Pizarro, Matos and Bueno [4].
[4] Ranges derived from bituminous coal properties [6,52,67,68].

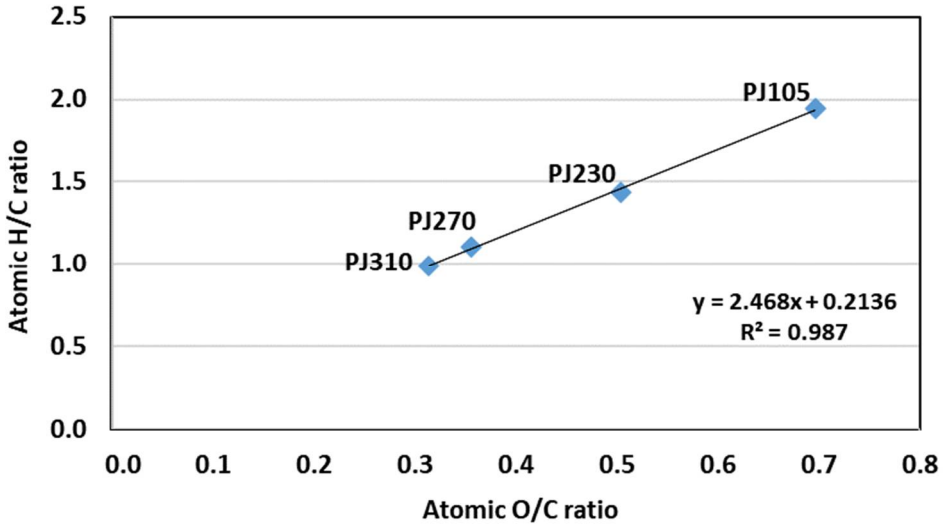

Figure S1. Van Krevelen diagram of the *P. juliflora* samples.

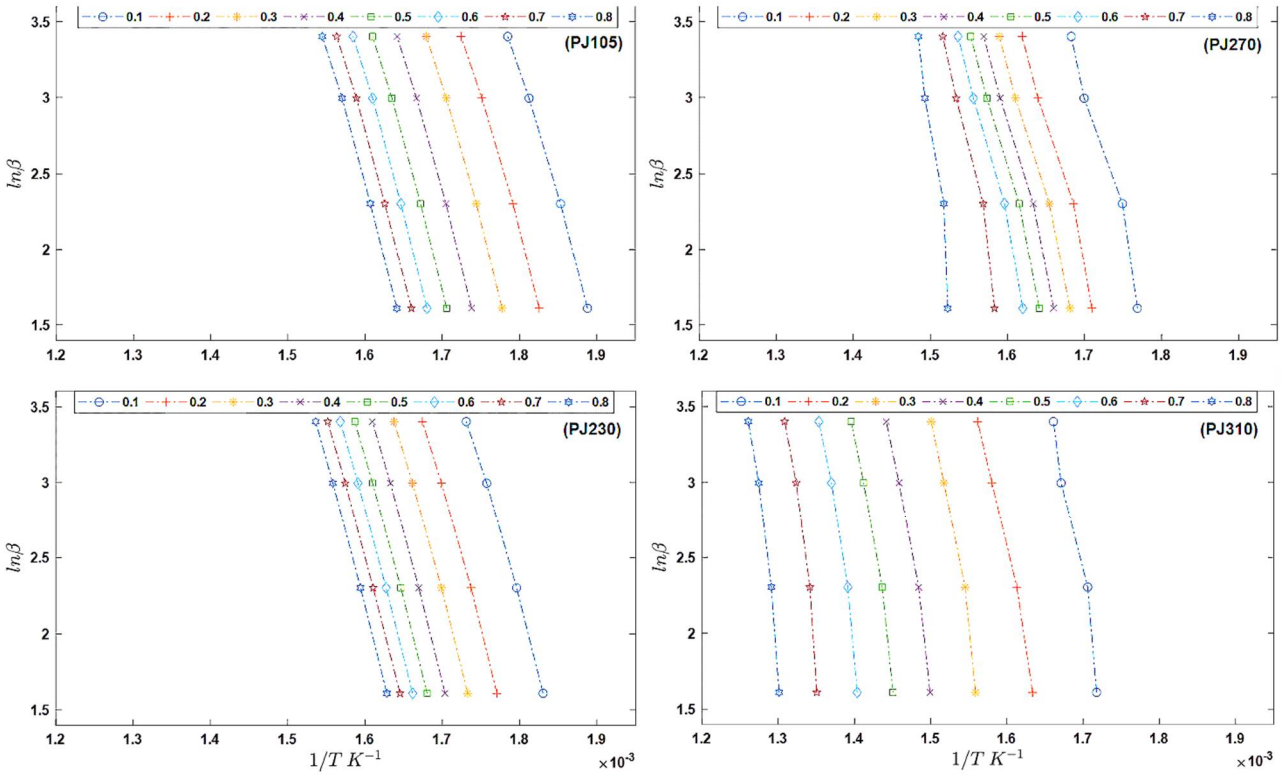

Figure S2. Estimation of activation energy using the FWO isoconversional method.

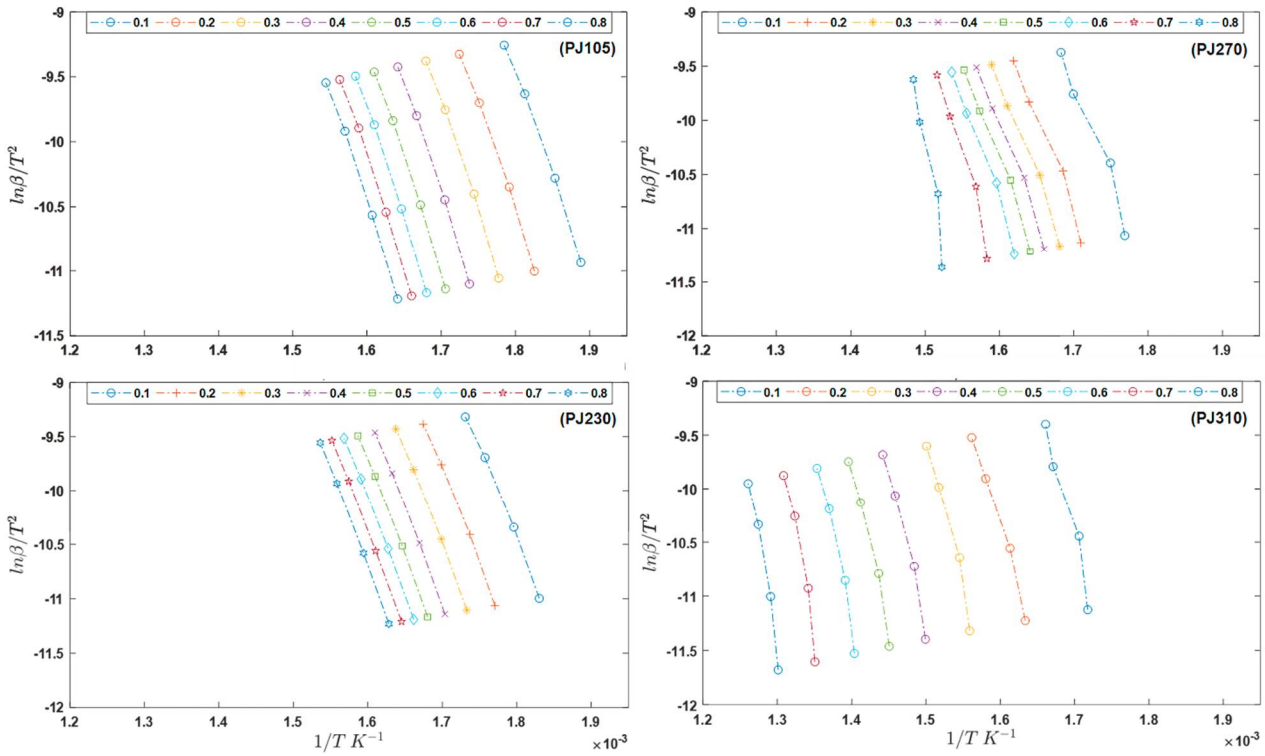

Figure S3. Estimation of activation energy using the KAS isoconversional method.