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Supplementary material to

INTEGRATED NEURAL NETWORK AND ASPEN PLUS MODEL FOR ENTRAINED FLOW GASIFICATION KINETICS INVESTIGATION

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Table S1. Mositure content, dry-basis (db) elemental composition (%) and LHV (MJ/kg) of feedstock materials used in this study.

Reference	Moisture	Ash $_{db}$	C $_{db}$	H $_{db}$	N $_{db}$	Cl $_{db}$	S $_{db}$	O $_{db}$	LHV
[1]	39.31	34.65	38.24	5.40	0.76	0.00	0.15	20.79	8.24 $_{wb}$
[1]	43.03	65.01	19.52	2.83	0.59	0.00	0.14	11.91	3.01 $_{wb}$
[1]	53.05	27.95	41.00	5.74	1.07	0.00	0.16	24.09	6.06 $_{wb}$
[1]	53.50	46.82	30.05	4.23	0.93	0.00	0.17	17.80	4.33 $_{wb}$
[1]	51.56	54.71	25.33	3.61	0.82	0.00	0.19	15.34	3.57 $_{wb}$
[1]	47.20	40.47	38.29	5.48	0.70	0.00	0.15	14.92	6.73 $_{wb}$
[1]	39.19	20.56	44.57	6.07	1.22	0.00	0.26	27.33	9.44 $_{wb}$
[1]	43.70	37.50	34.56	4.35	0.87	0.63	0.17	21.92	4.20 $_{wb}$
[1]	49.09	54.94	25.05	3.59	0.77	0.00	0.16	15.49	3.94 $_{wb}$
[1]	51.49	36.91	36.59	5.07	0.97	0.00	0.21	20.25	5.83 $_{wb}$
[1]	51.91	42.87	34.00	4.80	0.94	0.00	0.17	17.21	5.44 $_{wb}$
[1]	51.58	35.05	38.13	5.41	0.89	0.00	0.16	20.36	6.34 $_{wb}$
[1]	42.36	62.96	21.62	3.19	0.59	0.00	0.12	11.52	4.20 $_{wb}$
[1]	58.87	27.26	43.03	5.96	1.09	0.00	0.20	22.46	5.76 $_{wb}$
[1]	40.94	40.20	35.29	5.01	0.78	0.00	0.17	18.54	7.40 $_{wb}$
[1]	49.91	21.24	45.09	6.19	1.09	0.00	0.24	26.14	7.75 $_{wb}$
[1]	47.67	53.22	26.92	3.80	0.69	0.00	0.15	15.22	4.47 $_{wb}$
[1]	53.51	38.08	34.83	4.90	0.86	0.00	0.17	21.16	5.19 $_{wb}$
[1]	51.37	53.21	26.75	4.12	0.74	0.00	0.15	15.33	4.01 $_{wb}$
[1]	55.99	52.78	26.00	3.66	0.97	0.00	0.27	16.31	2.86 $_{wb}$
[1]	24.95	76.76	12.84	1.96	0.29	0.00	0.12	8.03	3.36 $_{wb}$
[2]	51.87	30.81	40.44	4.75	0.94	0.21	1.72	21.13	11.61 $_{db}$
[3]	48.00	46.15	30.77	4.62	0.77	0.00	0.39	17.30	9.95 $_{db}$
[4]	20.00	9.51	43.71	7.73	1.95	0.00	0.40	37.66	16.01 $_{db}$
[5]	44.00	30.82	37.36	5.21	0.95	0.21	0.18	25.27	6.80 $_{db}$
[6]	7.56	17.80	49.03	5.24	1.23	0.00	0.30	26.40	16.42 $_{db}$
[7]	6.30	12.40	51.60	6.30	0.80	0.00	0.20	28.70	20.17 $_{db}$
[8]	14.90	22.44	48.65	6.70	1.41	0.00	0.24	20.56	19.99 $_{db}$
[9]	57.90	10.11	47.65	6.21	2.38	0.22	0.31	33.12	3.90 $_{wb}$

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Table S1. Continued.

Reference	Moisture	Ash $_{db}$	C $_{db}$	H $_{db}$	N $_{db}$	Cl $_{db}$	S $_{db}$	O $_{db}$	LHV
[9]	51.33	9.61	48.49	6.35	2.15	0.24	0.29	32.87	6.00 $_{wb}$
[9]	37.92	8.35	50.44	6.45	1.29	0.08	0.24	33.14	10.21 $_{wb}$
[9]	32.95	8.43	51.32	6.84	1.35	0.14	0.24	31.68	12.06 $_{wb}$
[9]	26.61	7.60	50.80	6.87	1.73	0.62	0.32	32.06	13.71 $_{wb}$
[10]	51.87	30.81	40.44	4.75	0.94	0.21	1.72	21.13	14.01 $_{db}$
[11]	25.49	33.15	36.38	4.56	1.88	0.00	0.41	23.62	12.88 $_{db}$
[12]	50.00	5.16	48.27	6.16	2.56	1.24	0.28	36.33	18.61 $_{db}$
[13]	46.54	16.52	44.43	5.73	1.60	0.00	0.22	31.50	7.74 $_{wb}$
[14]	51.70	46.70	29.53	1.45	1.04	0.00	0.75	20.54	9.70 $_{db}$
[15]	61.26	14.03	43.21	6.22	2.13	1.09	0.22	33.10	6.92 $_{wb}$
[16]	48.00	34.61	34.62	4.87	1.29	0.67	0.31	23.63	11.46 $_{db}$
[17]	81.12	0.90	44.26	6.19	1.38	0.00	0.41	46.86	16.46 $_{db}$
[17]	57.25	7.16	48.59	6.43	2.58	0.00	0.46	34.78	18.02 $_{db}$
[17]	60.34	1.70	46.72	5.95	0.00	0.00	0.32	45.31	16.24 $_{db}$
[17]	67.81	9.60	41.26	5.62	0.78	0.00	0.39	42.35	13.97 $_{db}$
[17]	71.03	5.24	43.90	6.31	1.55	0.00	0.37	42.63	15.15 $_{db}$
[17]	55.86	3.98	43.80	5.81	0.39	0.00	0.35	45.67	15.62 $_{db}$
[17]	64.58	4.71	45.04	6.07	3.47	0.00	0.50	40.21	16.96 $_{db}$
[17]	46.46	7.19	42.02	5.58	1.25	0.00	0.43	43.53	14.19 $_{db}$
[17]	47.09	15.37	37.02	5.01	2.20	0.00	0.45	39.95	12.26 $_{db}$
[17]	62.57	7.70	40.11	5.52	1.36	0.00	0.33	44.98	13.50 $_{db}$
[17]	46.87	1.71	48.07	5.99	0.05	0.00	0.39	43.79	17.33 $_{db}$
[17]	61.88	1.08	44.37	5.87	0.94	0.00	0.32	47.42	15.72 $_{db}$
[17]	69.23	5.45	43.84	6.51	1.03	0.00	0.37	42.80	15.11 $_{db}$
[17]	41.90	1.00	50.81	6.36	1.08	0.00	0.36	40.39	18.81 $_{db}$
[17]	54.27	1.02	50.34	6.26	0.00	0.00	0.31	42.07	17.54 $_{db}$
[17]	45.58	2.06	49.03	5.86	0.04	0.00	0.34	42.67	17.44 $_{db}$
[17]	62.68	4.41	43.00	5.69	2.11	0.00	0.41	44.38	15.07 $_{db}$
[17]	54.64	0.15	46.89	5.90	0.62	0.00	0.37	46.07	16.53 $_{db}$
[17]	65.70	5.72	41.33	5.90	0.39	0.00	0.34	46.32	13.90 $_{db}$
[17]	56.94	10.05	37.94	5.19	0.32	0.00	0.35	46.15	12.55 $_{db}$
[17]	58.51	3.48	47.70	5.88	0.05	0.00	0.31	42.58	16.81 $_{db}$
[17]	56.71	1.01	46.30	6.08	0.06	0.00	0.35	46.20	15.59 $_{db}$
[17]	47.68	7.31	49.03	6.40	0.94	0.00	0.42	35.90	17.87 $_{db}$
[17]	64.30	8.96	44.53	6.01	0.80	0.00	0.36	39.34	15.27 $_{db}$
[17]	63.17	0.90	48.23	6.00	0.11	0.00	0.34	44.42	17.17 $_{db}$
[17]	61.36	5.55	44.31	5.70	0.92	0.00	0.42	43.10	15.29 $_{db}$
[17]	62.93	11.05	45.28	5.89	0.94	0.00	0.42	36.42	16.01 $_{db}$
[17]	50.31	2.31	47.05	6.70	0.86	0.00	0.35	42.73	17.15 $_{db}$
[17]	60.20	4.91	42.08	5.92	0.85	0.00	0.36	45.88	13.61 $_{db}$
[17]	55.23	11.10	39.90	5.38	0.42	0.00	0.40	42.80	13.65 $_{db}$
[17]	56.81	5.36	44.78	5.75	0.49	0.00	0.40	43.22	15.62 $_{db}$
[17]	63.32	6.45	42.96	6.21	8.01	0.00	0.57	35.80	16.35 $_{db}$
[17]	54.42	8.28	45.93	6.79	6.33	0.00	0.66	32.01	18.22 $_{db}$
[17]	59.84	7.87	45.24	6.46	6.37	0.00	0.65	33.41	17.02 $_{db}$
[17]	63.20	13.06	38.97	5.45	1.79	0.00	0.42	40.31	13.57 $_{db}$
[17]	65.87	4.62	50.47	6.20	2.41	0.00	0.47	35.83	18.73 $_{db}$
[17]	75.84	1.60	48.28	5.73	0.10	0.00	0.40	43.89	16.96 $_{db}$
[17]	45.61	0.97	51.98	6.13	0.03	0.00	0.48	40.41	17.85 $_{db}$
[17]	42.21	0.72	53.30	6.69	1.57	0.00	0.39	37.33	19.45 $_{db}$
[18]	1.84	27.03	57.16	4.02	1.43	0.00	10.06	0.31	32.86 $_{db}$
[18]	1.67	12.30	74.56	4.84	1.94	0.00	4.07	2.30	33.99 $_{db}$
[18]	1.18	7.72	79.97	5.16	1.38	0.00	2.38	3.39	35.45 $_{db}$
[18]	3.38	25.02	62.41	4.45	0.95	0.00	4.16	3.01	31.75 $_{db}$
[18]	0.90	6.29	81.01	4.93	1.41	0.00	2.10	4.26	35.24 $_{db}$
[18]	5.16	33.56	51.56	3.35	1.11	0.00	6.68	3.74	30.99 $_{db}$
[18]	4.89	46.67	42.80	2.49	0.70	0.00	3.73	3.59	30.17 $_{db}$
[18]	9.31	11.71	67.80	4.77	1.68	0.00	7.42	6.62	30.89 $_{db}$
[18]	2.17	61.15	29.61	2.38	0.73	0.00	1.66	4.48	25.85 $_{db}$
[18]	16.25	9.28	69.93	4.66	1.40	0.00	1.71	13.02	30.13 $_{db}$
[19]	8.72	0.09	47.77	6.38	0.11	0.00	0.26	36.67	16.14 $_{db}$
[19]	9.80	0.79	46.63	6.49	0.09	0.00	0.36	35.84	15.95 $_{db}$
[19]	9.31	0.22	47.67	6.59	0.08	0.00	0.09	36.04	16.05 $_{db}$
[19]	9.65	0.61	46.29	6.95	0.12	0.00	0.35	36.03	15.91 $_{db}$
[19]	3.56	0.69	64.00	11.27	0.29	0.00	0.14	20.05	28.90 $_{db}$
[19]	5.73	2.19	57.00	8.90	0.07	0.00	0.28	25.83	23.45 $_{db}$
[19]	9.60	0.07	48.54	6.19	0.06	0.00	0.09	35.45	16.54 $_{db}$
[19]	8.02	3.81	45.03	6.09	0.97	0.00	0.32	35.76	15.32 $_{db}$
[19]	9.26	4.32	45.69	6.44	1.00	0.00	0.38	32.91	15.58 $_{db}$
[19]	8.20	1.12	47.40	6.28	0.33	0.00	0.28	36.39	16.35 $_{db}$
[19]	3.25	0.13	50.48	6.33	0.09	0.00	0.17	39.55	17.55 $_{db}$
[19]	3.41	0.39	62.88	9.63	1.11	0.00	0.27	22.31	27.48 $_{db}$
[19]	7.77	0.42	49.64	6.18	0.10	0.00	0.38	35.51	16.61 $_{db}$

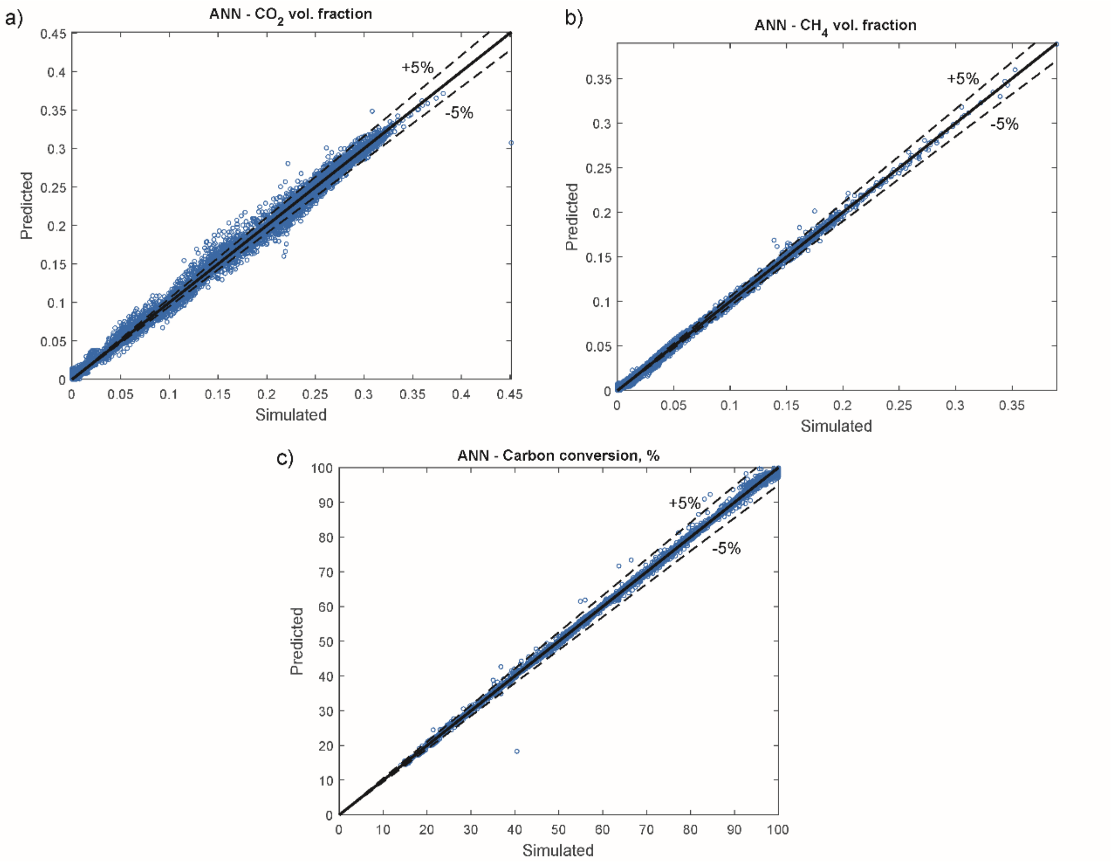

Figure S1. Simulated and predicted data on CO_2 content, CH_4 content and carbon conversion according to neural network model.

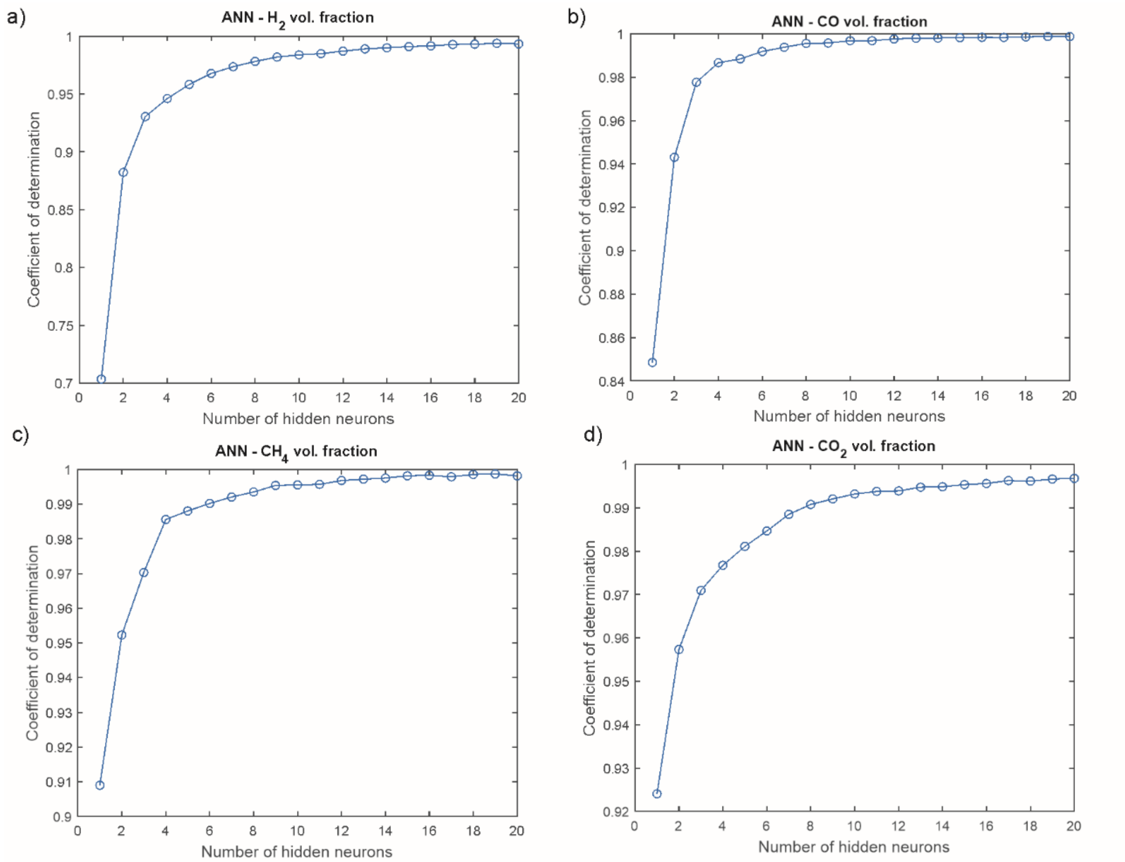

Figure S2. The impact of hidden neurons number on coefficient of determination for H_2, CO, CH_4 and CO_2 prediction via neural network.

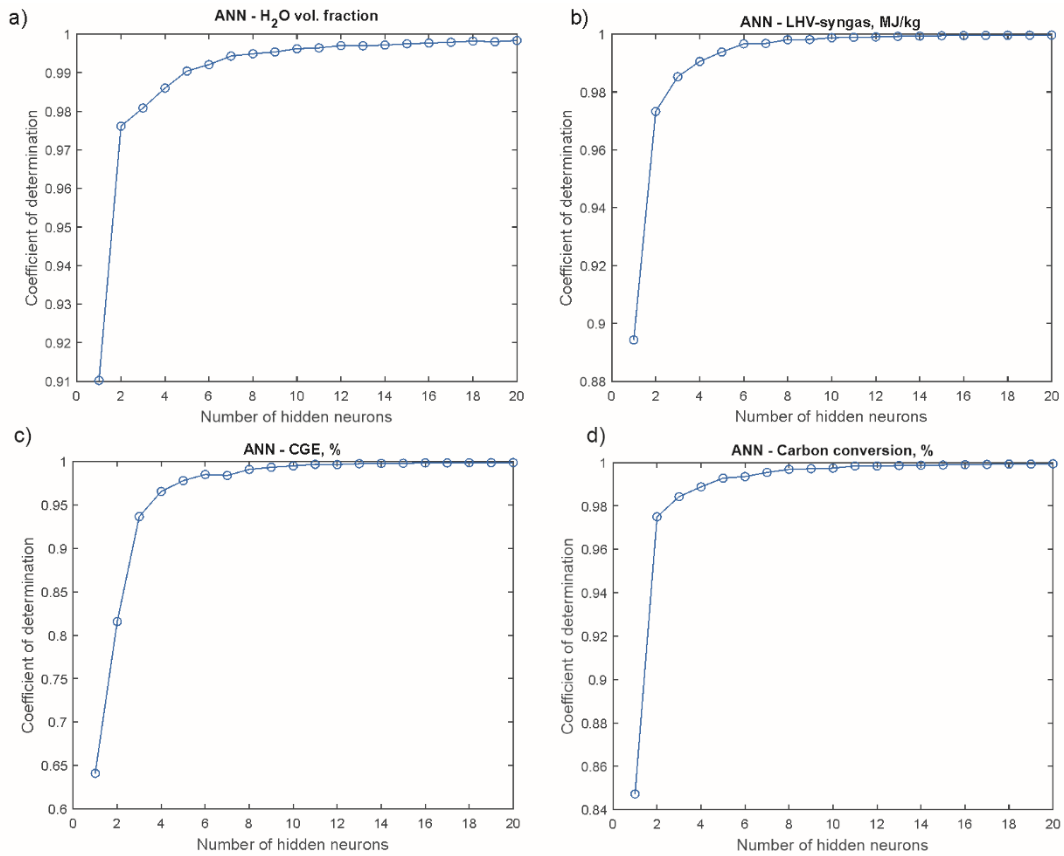

Figure S3. The impact of hidden neurons number on coefficient of determination for H_2O content, syngas LHV, CGE and carbon conversion prediction via neural network.

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