Supplementary Material

Cleaner geopolymer prepared by co-activation of gasification coal fly ash and steel slag: durability properties and economic assessment

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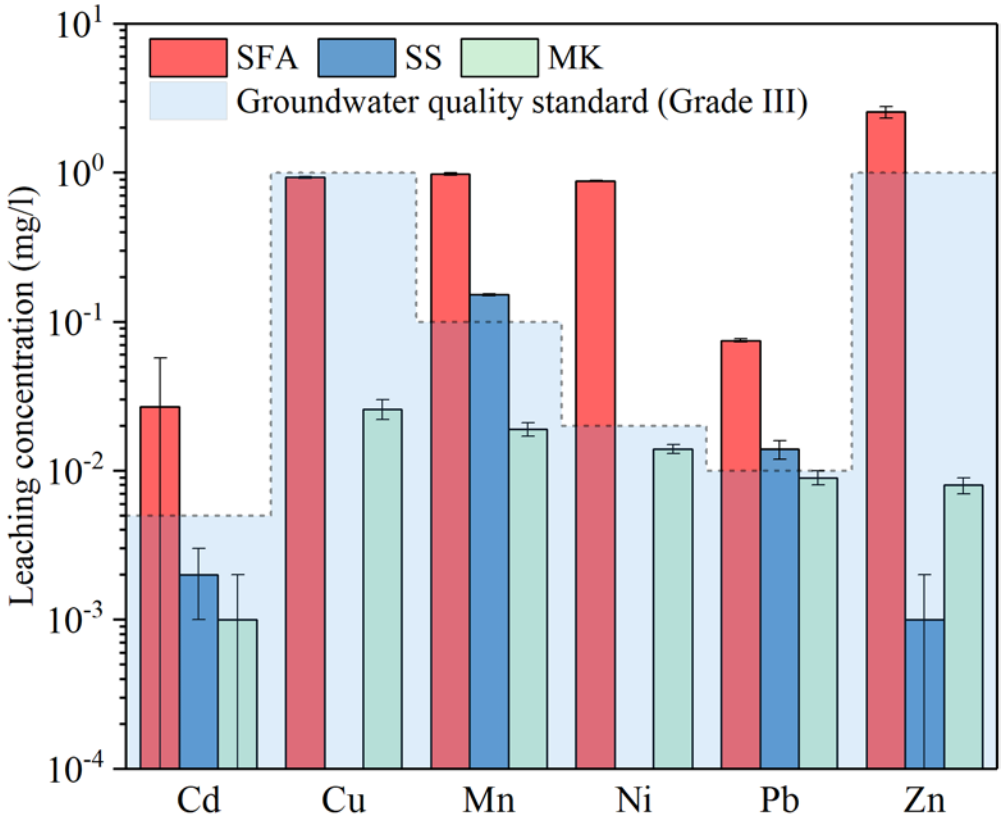

Figure S1 Heavy metals leaching concentration of raw materials

Table S1 Element compositions of ASK1 and ASK2 at diverse curing ages (%)

Samples	O	Na	Mg	Al	Si	K	Ca	Fe	Others
ASK1-3D	54.29	3.52	0.69	9.31	12.28	1.01	3.57	4.73	10.6
ASK1-28D	56.82	3.33	0.66	7.12	10.61	0.76	3.98	3.54	13.18
ASK1-60D	56.09	3.51	0.68	7.4	11.36	0.8	4.18	3.72	12.26
ASK2-3D	51.2	5.95	1.52	3.12	5.62	0.28	11.73	7.75	12.83
ASK2-28D	51.23	5.95	1.44	3.07	5.64	0.33	11.79	7.78	12.77
ASK2-60D	51.37	5.7	1.52	3.02	5.51	0.38	11.79	7.79	12.92

S2. Economic Assessment of geopolymer

The cost of producing the geopolymer paste and concrete were estimated. The geopolymer concrete was marked as ASK1C and ASC2C. Market rates of the materials, electricity consumption, and labor were used to calculate the cost of the producing 1 m^3 of geopolymer paste and concrete. The mixing amount of fine and coarse aggregate used in 1 m^3 of concrete refer to Akhtar [1]. Market price were used to calculate the material cost. Local electricity and water unit rate were used for the mixing and operating cost. The Ministry of Human Resources and Social Security (MHRSS) of China has released the median salary in different industries [2]. Table S1 shows the details of quantity and cost of different materials, operating and labor used in the production of different concrete.

Table S2 Details of quantity and cost of items involved in the production of different geopolymer paste and geopolymer concrete

Cost components	Components	Quantity				Unit rate	Cost (¥)			
		ASK1	ASK2	ASK1C	ASK2C	(¥)	ASK1	ASK2	ASK1C	ASK2C
Material cost	Shell Coal Gasification Fly Ash (kg)	1133.9	154.2	231.2	31.5	0.025	28.35	3.86	5.78	0.79
	Steel Slag (kg)	567.0	1542.2	115.6	315.2	0.05	28.35	77.11	5.78	15.76
	Metakaolin (kg)	51.0	50.9	10.4	10.4	0.45	22.96	22.90	4.68	4.68
	Sodium Hydroxide Flakes (kg)	46.3	46.2	9.4	9.4	3.50	162.01	161.60	33.03	33.03
	Sodium Silicate (kg)	307.6	306.8	62.7	62.7	1.30	399.83	398.80	81.51	81.51
	Sand/Fine Aggregate (kg)	0.00	0.00	724	724	0.04	0.00	0.00	28.96	28.96
	Coarse Aggregate - Crushed stone (kg)	0.00	0.00	1340	1340	0.03	0.00	0.00	40.20	40.20
	Water for mixing and workability (kg)	224.3	223.7	45.7	45.7	0.00377	0.85	0.84	0.17	0.17
Operating cost	Ball-milling (kWh)	10.2	27.8	2.1	5.7	0.85	8.67	23.60	1.77	4.82
	Mixing (kWh)	0.3	0.3	0.3	0.3	0.85	0.23	0.23	0.25	0.25
	Vibrator (kWh)	0.7	0.7	0.7	0.7	0.85	0.57	0.57	0.57	0.57
Labor cost	Labour (days)	1.765	1.765	1.765	1.765	59.0	104.14	104.14	104.14	104.14
Total Cost (¥/m^3)							755.95	793.64	306.83	314.88

References

[1] N. Akhtar, T. Ahmad, D. Husain, A. Majdi, M.T. Alam, N. Husain, A.K.S. Wayal, Ecological footprint and economic assessment of conventional and geopolymer concrete for sustainable construction, Journal of Cleaner Production (2022) 134910.

[2] http://www.mohrss.gov.cn/SYrlzyhshbzb/laodongguanxi_/fwyd/202209/t20220910_486850.html