# Supplementary materials

Recycling arsenic-containing bio-leaching residue after thermal treatment in cemented paste backfill: Structure modification, binder properties and environmental assessment

Dengfeng Zhao1,2), Shiyu Zhang3),🖂, and Yingliang Zhao4)

1) Department of Mining Engineering, Lyuliang University, Lvliang 033000, China

2) School of Civil and Environmental Engineering, University of Science and Technology Beijing, Beijing 100083, China

3) School of Mining Engineering, Taiyuan University of Technology, Taiyuan 030024, China

4) Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University, Hong Kong 00852, China

**Table S1. Vibrational spectra of ABR and band assignments**

|  |  |  |
| --- | --- | --- |
| Bands position (± 5 cm−1) | Band assignments | References |
| 3620, 3550, 3407 | OH stretching of Al–OH, Ca2–OH, Ca–OH2 | [1] |
| 1622 | OH bending of Ca–OH2 | [1] |
| 1438 | CO32- stretching (ν3) | [1] |
| 1150 | S–O asymmetric stretching vibration (ν3) | [2] |
| 1108, 1007 | S–O symmetric stretching vibration (ν1) | [2] |
| 870 | As–O–Ca stretching vibration, CO32- symmetric bending | [1–2] |
| 617, 710 | As–O symmetric stretching vibration | [2–3] |
| 679, 602 | S–O in-plane bending vibrations (ν4) | [2] |

**Table S2. Compressive strength of the CPB samples**  MPa

|  |  |  |
| --- | --- | --- |
| Sample | 3d | 28d |
| OPC | 1.37 ± 0.06 | 2.79 ± 0.13 |
| CPB0 | 0.89 ± 0.04 | 2.01 ± 0.09 |
| CPB150 | 0.90 ± 0.07 | 2.11 ± 0.10 |
| CPB350 | 0.88 ± 0.06 | 2.08 ± 0.13 |
| CPB600 | 1.28 ± 0.07 | 2.57 ± 0.07 |
| CPB800 | 1.51 ± 0.09 | 1.97 ± 0.08 |

Note: The binder/tailings mass ratio was 1/8, and solid concentration was 76 wt% was used in the present work.

 

 

**Fig. S1. Particle size distribution of the raw materials: (a) ABR, (b) BFS, (c) OPC, and (d) CS.**



**Fig. S2. EDS of ABR before and after thermal treatment: (a) ABR0, (b) ABR150, (c) ABR350, (d) ABR600, and (e) ABR800.**

**Reference**

[1] J.W. Bullard, H.M. Jennings, R.A. Livingston, *et al.*, Mechanisms of cement hydration, *Cem*. *Concr*. *Res*., 41(2011), No. 12, p. 1208.[2] R.X. He, S.Y. Zhang, X.L. Zhang, Z.H. Zhang, Y.L. Zhao, and H.X. Ding, Copper slag: The leaching behavior of heavy metals and its applicability as a supplementary cementitious material, *J*. *Environ*. *Chem*. *Eng*., 9(2021), No. 2, art. No. 105132.[3] D. Marchon, P. Juilland, E. Gallucci, L. Frunz, and R.J. Flatt, Molecular and submolecular scale effects of comb-copolymers on tri-calcium silicate reactivity: Toward molecular design, *J*. *Am*. *Ceram*. *Soc*., 100(2017), No. 3, p. 817.