Supplementary data for

CO2 pretreatment to aerated concrete with high-volume industry wastes enables a sustainable precast concrete industry

Dongming Yan[†], Jiayu Lu[†], Yifu Sun[‡], Tao Wang[‡], Tao Meng[†], Qiang Zeng*[,†], Yi Liu*[, §]

†: College of Civil Engineering and Architecture, Zhejiang University, Hangzhou, 310058,China.

‡: State Key Laboratory of Clean Energy Utilization, Zhejiang University, Hangzhou, 310027, China.

§ :Institute for Composites Science Innovation (InCSI), School of Materials Science and Engineering, Zhejiang University,Hangzhou,310027, China.

Emails of the corresponding authors:

cengq14@zju.edu.cn (QZ)

liuyimse@zju.edu.cn (YL)

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1. Raw Materials Characterization

The chemical and mineral compositions of the cement, fly ash and GGBS as received were characterized by XRF and XRD. Table S1 shows the oxides of these raw materials. It is clear that the cement and fly ash contain high contents of CaO, while the fly ash and GGBS contain high mass fractions of SiO_2 and Al_2O_3. Moreover, MgO occupies more than 7% mass of the GGBS (Table S1).

Table S1. Chemical composition of materials (wt%)

	CaO	SiO_2	Al_2O_3	SO_3	Fe_2O_3	MgO	K_2O	TiO_2	Others
Cement	57.61	12.03	5.15	3.46	3.01	1.46	1.21	0.26	15.81
Slag	33.83	18.60	15.98	1.01	0.98	7.74	0.39	1.40	20.08
Fly ash	17.58	39.87	28.25	5.07	4.44	1.24	0.70	1.11	1.74

Figure S1 demonstrates the crystalline phases of the solid materials tested by XRD. The cement mainly containsC_3S, C_2S, C_3A, C_4FA and gypsum. The slag and fly ash share the crystals of mullite, quartz, calcium carbonate and calcium hydroxide, but the former also contains a certain amount of magnesium calcite (Fig. S1).

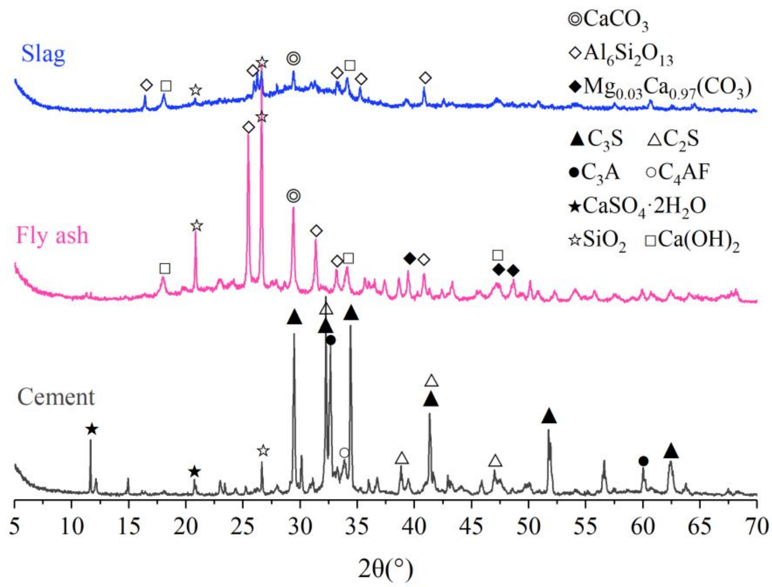

Fig. S1. XRD patterns of cement, fly ash and GGBFS used in this study.

The particle size distribution of the materials is shown in Fig. S2. The cement and fly ash share the similar particle size distribution with the 50% volume size of 17 μm, while the GGBS has the coarser particle sizes with the 50% volume size of 49 μm.

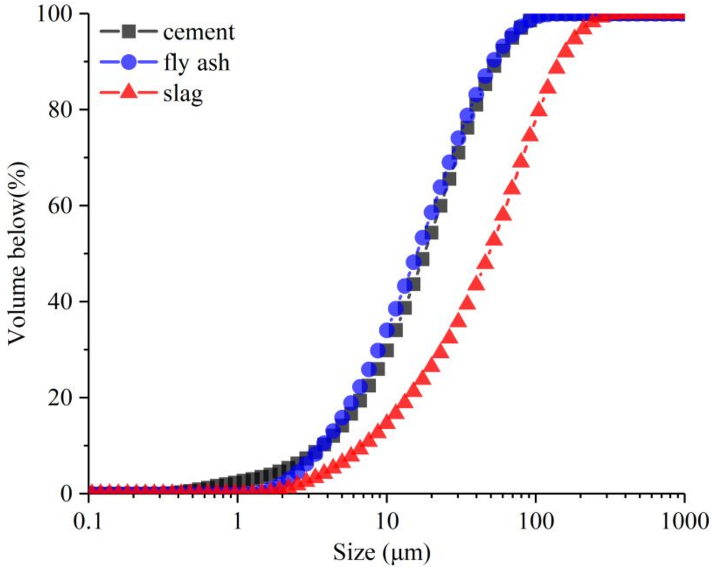

Fig. S2. Particle size distribution of cement, fly ash and GGBFS

2. Estimation process of absorption mass of CO_2 in AC blocks

The mass loss between 550~800 ℃ from the TG curve was considered as the mass of CO_2 absorbed by AC blocks (Fig. 4f). In order to calculated the mass of CO_2 absorbed by a AC block with the side length of 100 mm, we assumed that the CO_2 absorption decreased linearly with depth, and the calculation diagram was shown in Fig. S3. We took the carbonation data of AC blocks cured at 0.1 MPa as an example. CO_2 mass in the C0.1 sample was estimated as follows:

$$m_{CO_2}(\mathrm{C0.1}) = \frac{5^3}{10^3} \times 2.02 + \left(1 - \frac{5^3}{10^3}\right) \times 9.17 = 8.27625g$$

CO_2 mass in the Ref. sample was estimated as:

$$m_{CO_2}(\mathrm{Ref.}) = \frac{5^3}{10^3} \times 1.64 + \left(1 - \frac{5^3}{10^3}\right) \times 3.05 = 2.87375g$$

So, the neat CO_2 absorption capacity of the C0.1 block was:

$$m_{absorbed\ CO_2} = 8.27625 - 2.87375 \approx 5.4g$$

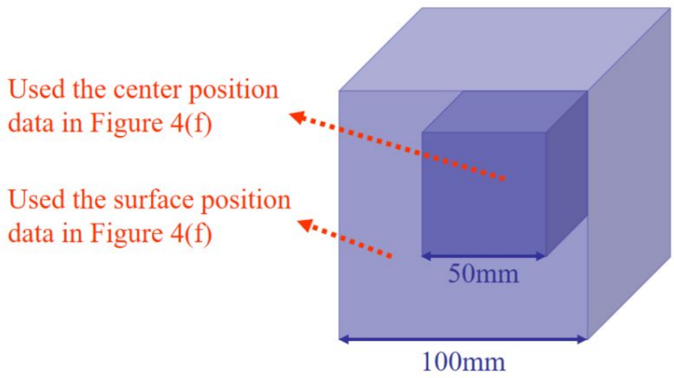

Fig. S3. Calculation of CO_2 absorption ratio in an AC block