Electronic supplementary information (ESI)

Evaluation of the dispersion of metakaolin-graphene oxide hybrid in water and cement pore solution: Can metakaolin really improve the dispersion of graphene oxide in the calcium-rich environment of hydrating cement matrix?

Kasra Amini 1, Siavash Soleimani Amiri 1, Ali Ghasemi 1, Sajjad Mirvalad 2*, Asghar Habibnejad Korayem 3*

1 MSc student, School of Civil Engineering, Iran University of Science and Technology, Tehran, Iran

2 Assistant Professor, School of Civil Engineering, Iran University of Science and Technology, Tehran, Iran

3 Associate Professor, School of Civil Engineering, Iran University of Science and Technology, Tehran, Iran

* Corresponding authors: Email: mirvalad@iust.ac.ir, and ahkorayem@iust.ac.ir
Fig. S1. (a) Particle size distribution (b) SEM image and (c) XRD pattern of metakaolin solid particles.
Fig. S2. Characterization of as-received GO (a) SEM micrograph (b) XRD pattern and (c) FTIR spectrum.
Table S1

The mix design of the prepared SCPS.

| Used chemical (g/l) |        |        |        |        |
|---------------------|--------|--------|--------|--------|
| CaSO₄.2H₂O          | 27.55  | Ca(OH)₂| Saturated | 22.44  |
| KOH                 | 22.44  | KOH    | 22.44  | 8.00   |
| NaOH                | 8.00   | NaOH   | 8.00   | 8.00   |

Table S2

The result of ICP-OES analysis of SCPS.

| Elemental concentration (ppm) |        |        |        |        |
|-------------------------------|--------|--------|--------|--------|
| K                             | 7518.8 | Na     | 3943.4 | Ca     | 780.05 |
| Si                            | 1.6    | Si     | 1.6    | Si     | 780.05 |
| Fe                            | 0.01   | Fe     | 0.01   | Fe     | 0.01   |
Fig. S3. Visual investigation of GO and MK-GO suspensions in water.

Fig. S4. Two-phase system of MK-GO suspension due to the centrifuging treatment, prior to the UV-vis characterization.
**Fig. S5.** Particle size distribution of (a) GO suspension and (b) MK suspension in water.

**Fig. S6.** Particle size distribution of MK-GO suspensions with different MK/GO weight ratios (a) MK/GO = 100 (b) MK/GO = 600 and (c) MK/GO = 1500 in water.
Fig. S7. Visual investigation of GO and MK-GO suspensions in SCPS.

Fig. S8. Particle size distribution of (a) MK suspension and (b) GO suspension in SCPS.
Fig. S9. Particle size distribution of MK-GO suspensions with different MK/GO weight ratios (a) MK/GO = 100 (b) MK/GO = 600 and (c) MK/GO = 1500 in SCPS.