Supporting Information

Enhanced Toughness of Hydroxyapatite-poly(ethylene terephthalate) Composites by Immersion in Water

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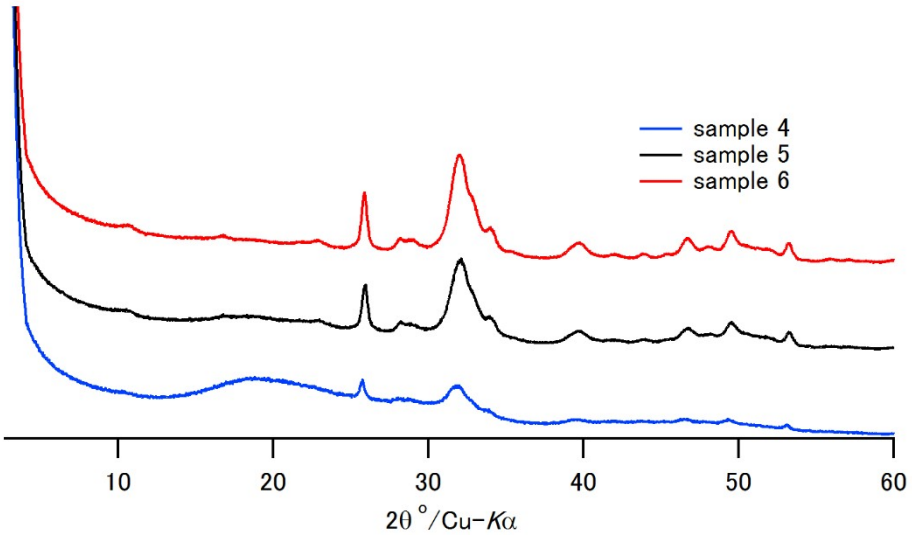
Number of pages: 15

Number of figures: 8

Number of tables 3.

1. Characterization of the composite powder



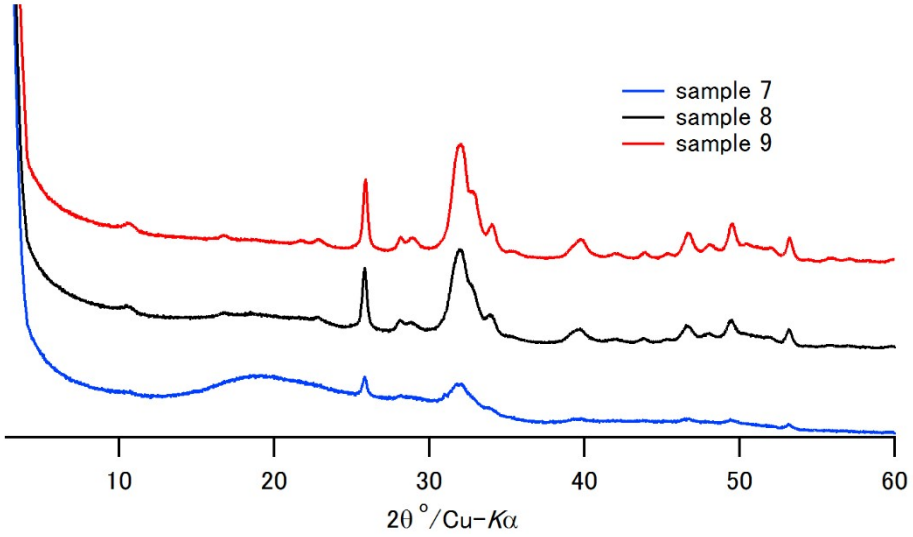
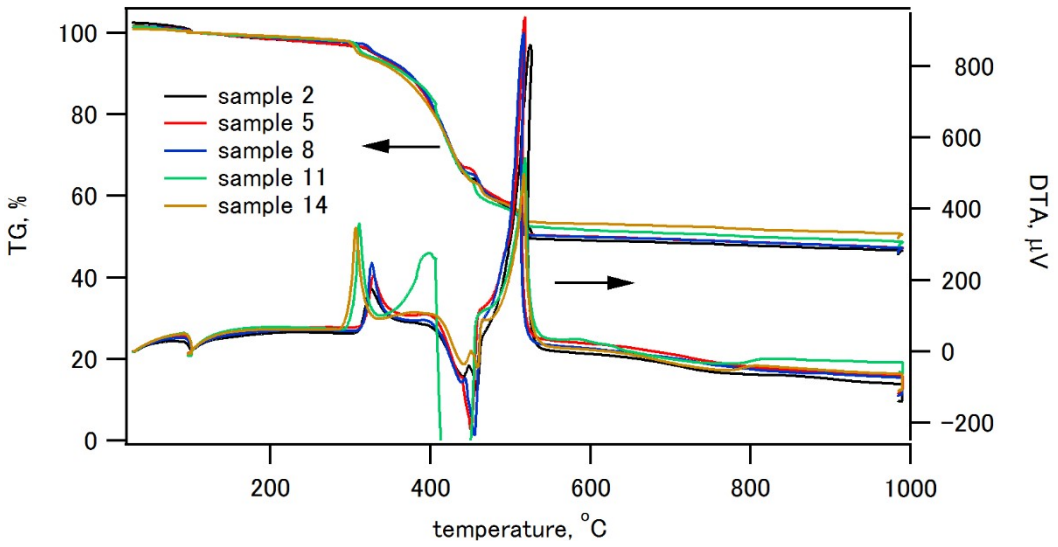


Figure S1. XRD patterns of samples 4-9.

(a)



(b)

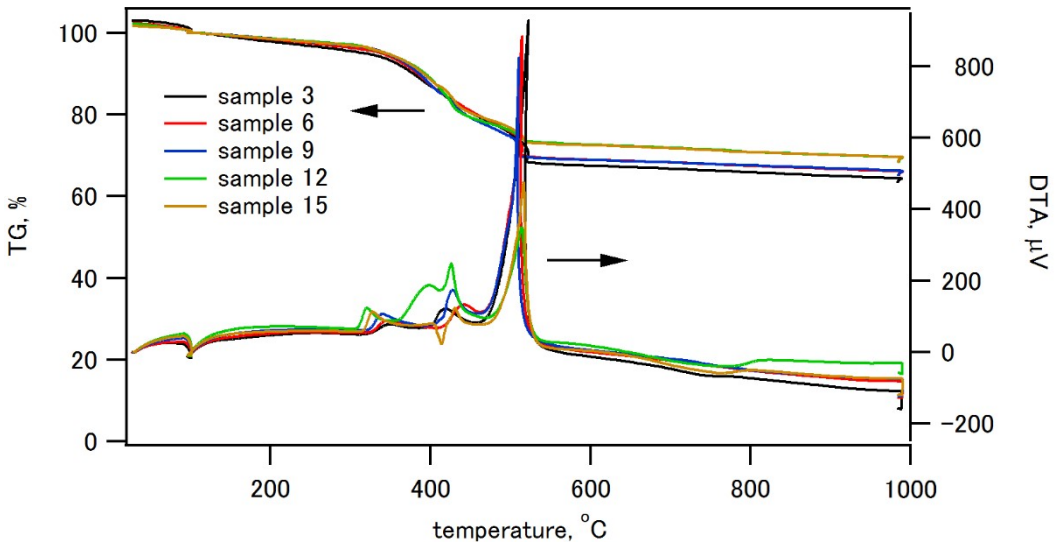


Figure S2. TG/DTA traces of the composites containing 50 wt% (a) and 70 wt% (b) of HAP.

2. Stress-strain curves of the composite compacts.

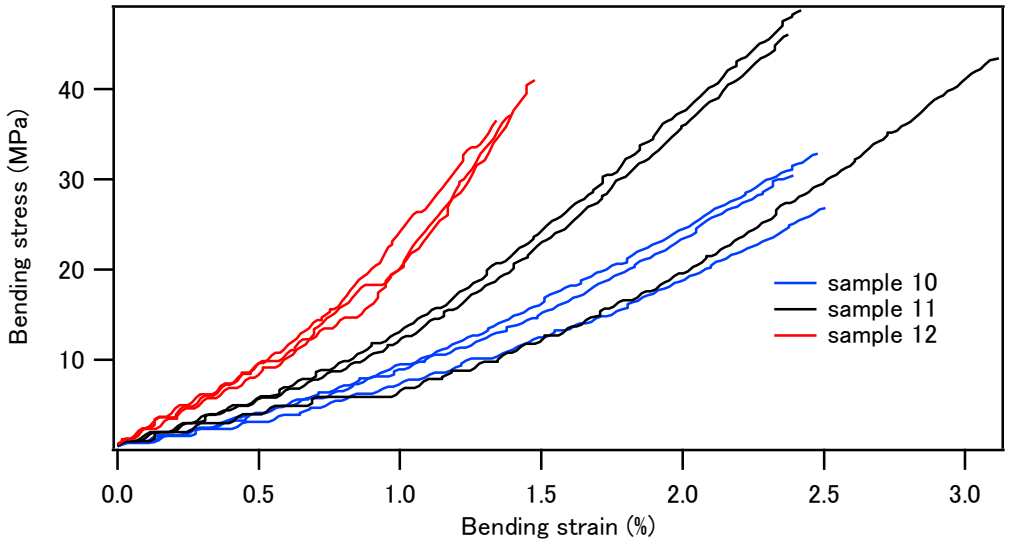
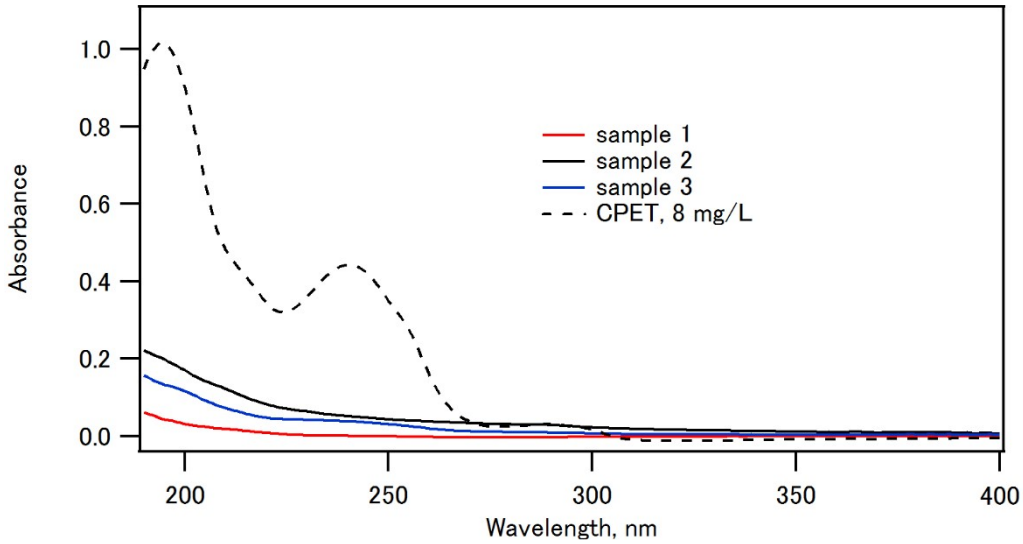


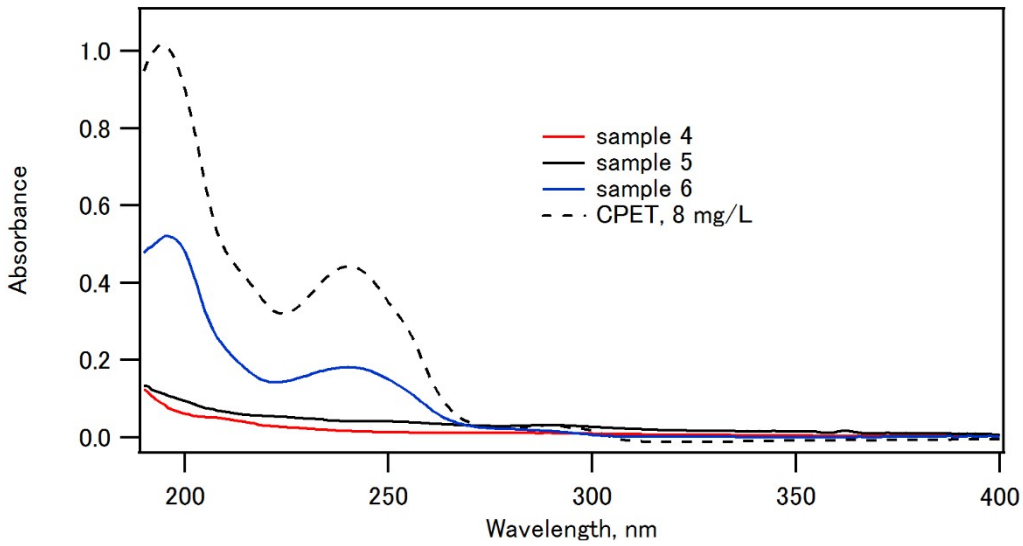
Figure S3. Representative stress-strain curves of samples 10-12 ($N = 3$).

3. Water resistant test: UV-visible spectra of the aqueous phase after immersion of the composite compacts.

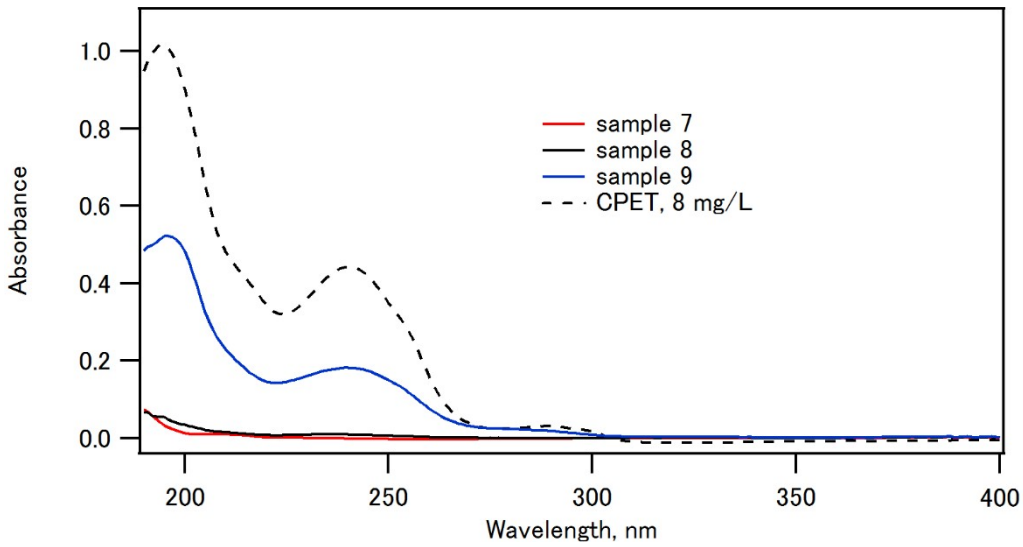
(a)



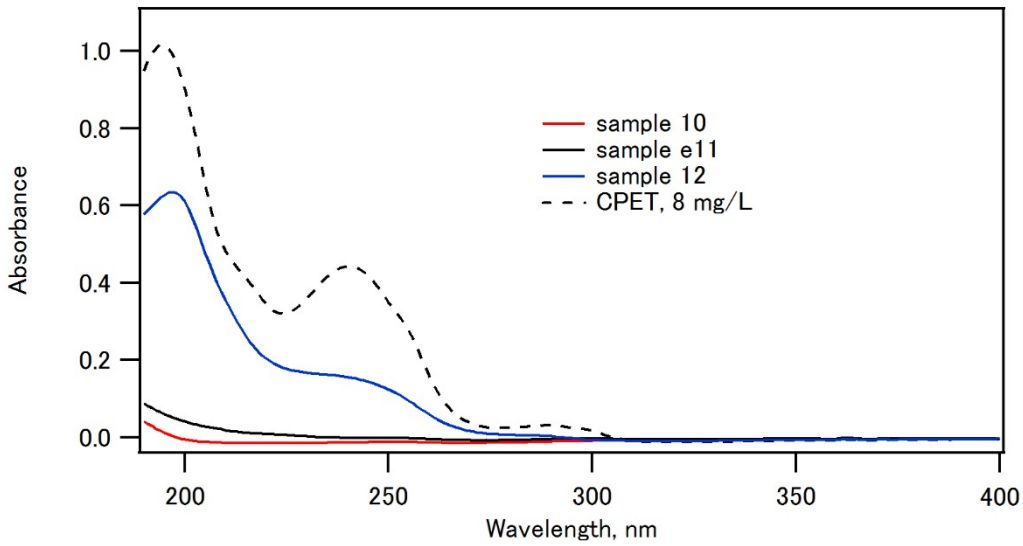
(b)



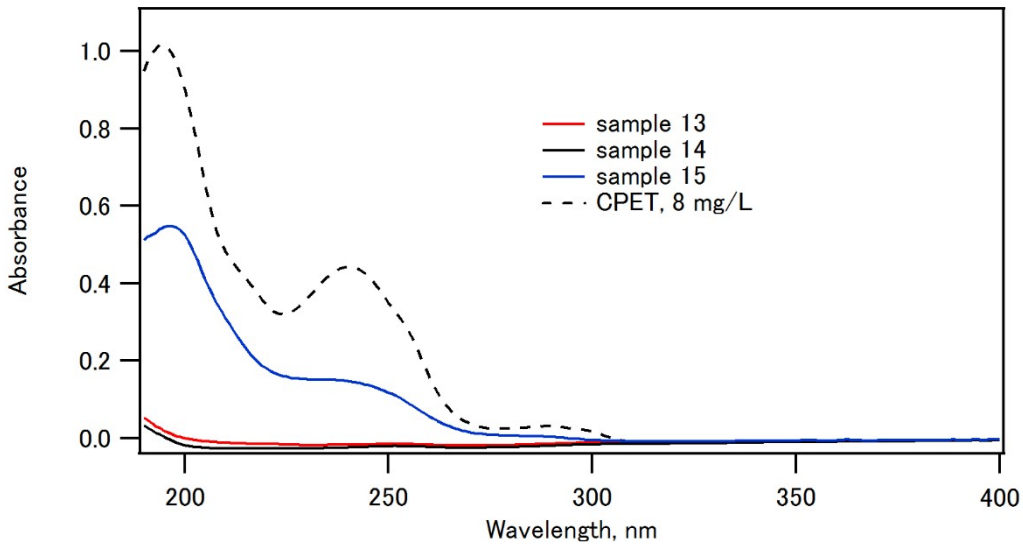
(c)


Absorbance
1.0
0.8
0.6
0.4
0.2
0.0
200
250
300
350
400
Wavelength, nm
sample 7
sample 8
sample 9
CPET, 8 mg/L

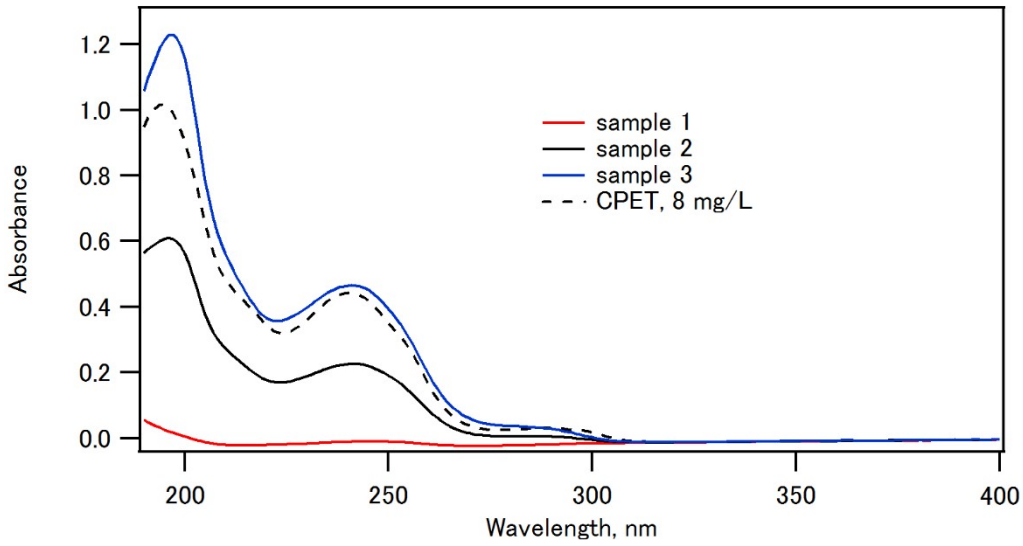
(d)


Absorbance
1.0
0.8
0.6
0.4
0.2
0.0
200
250
300
350
400
Wavelength, nm
sample 10
sample e11
sample 12
CPET, 8 mg/L

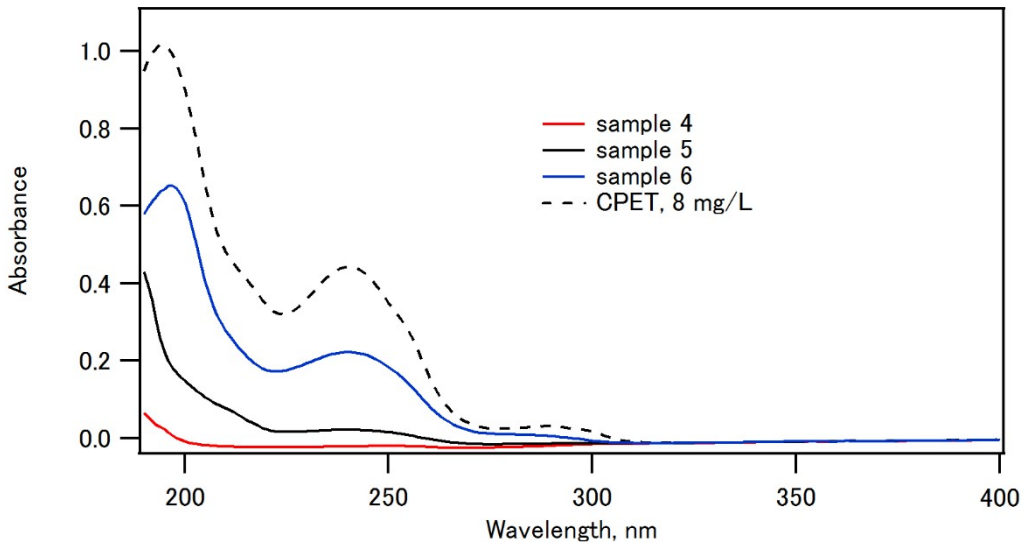
(e)


Absorbance
1.0
0.8
0.6
0.4
0.2
0.0
200
250
300
350
400
Wavelength, nm
sample 13
sample 14
sample 15
CPET, 8 mg/L

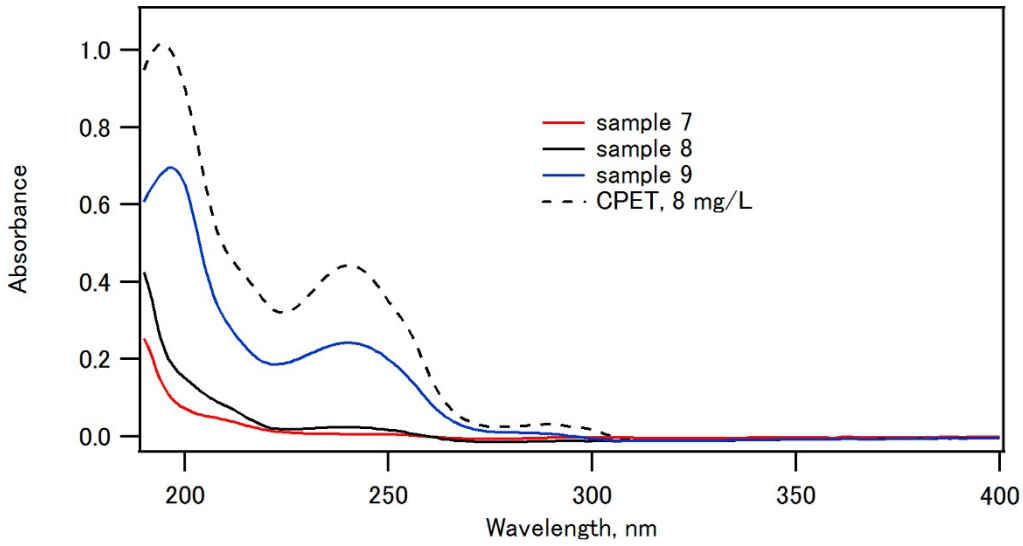
(f)


Absorbance
1.2
1.0
0.8
0.6
0.4
0.2
0.0
200
250
300
350
400
Wavelength, nm
sample 1
sample 2
sample 3
CPET, 8 mg/L

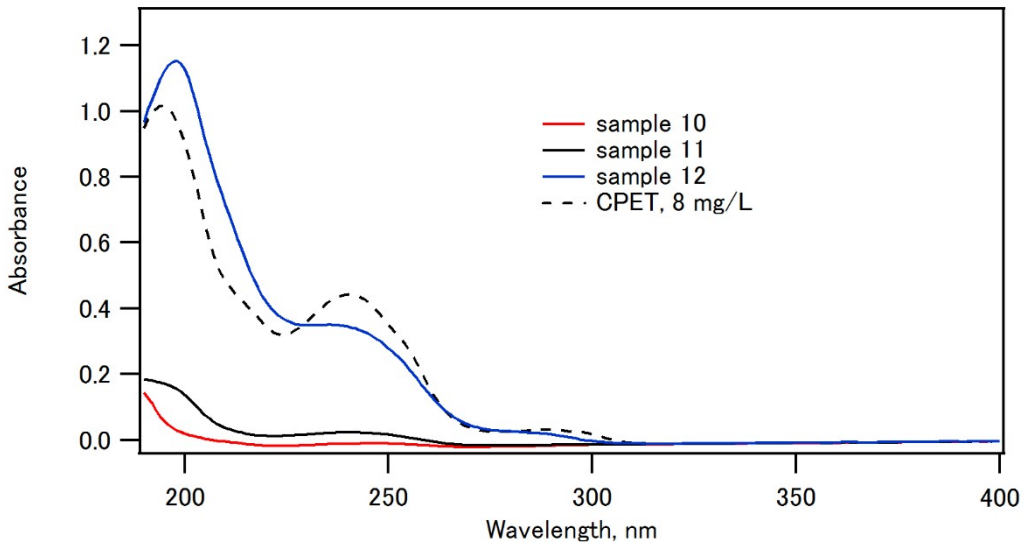
(g)


Absorbance
1.0
0.8
0.6
0.4
0.2
0.0
200
250
300
350
400
Wavelength, nm
sample 4
sample 5
sample 6
CPET, 8 mg/L

(h)


Absorbance
1.0
0.8
0.6
0.4
0.2
0.0
200
250
300
350
400
Wavelength, nm
sample 7
sample 8
sample 9
CPET, 8 mg/L

(i)



(j)

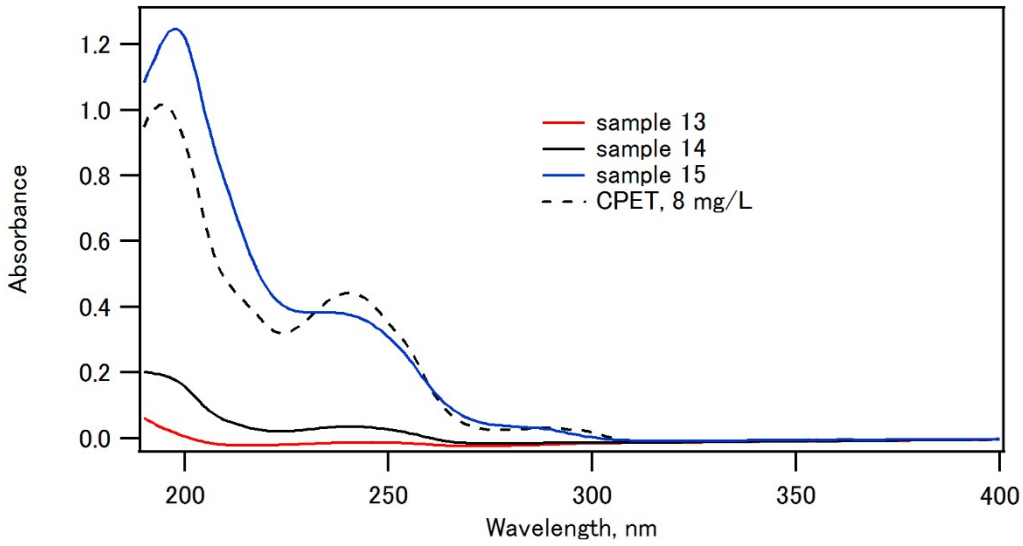


Figure S4. UV-visible spectra of the aqueous phase after immersion of the composite compacts. (a)--(e): immersion at room temperature for 24 h, (f)-(j): immersion at 37 °C for 1 week.

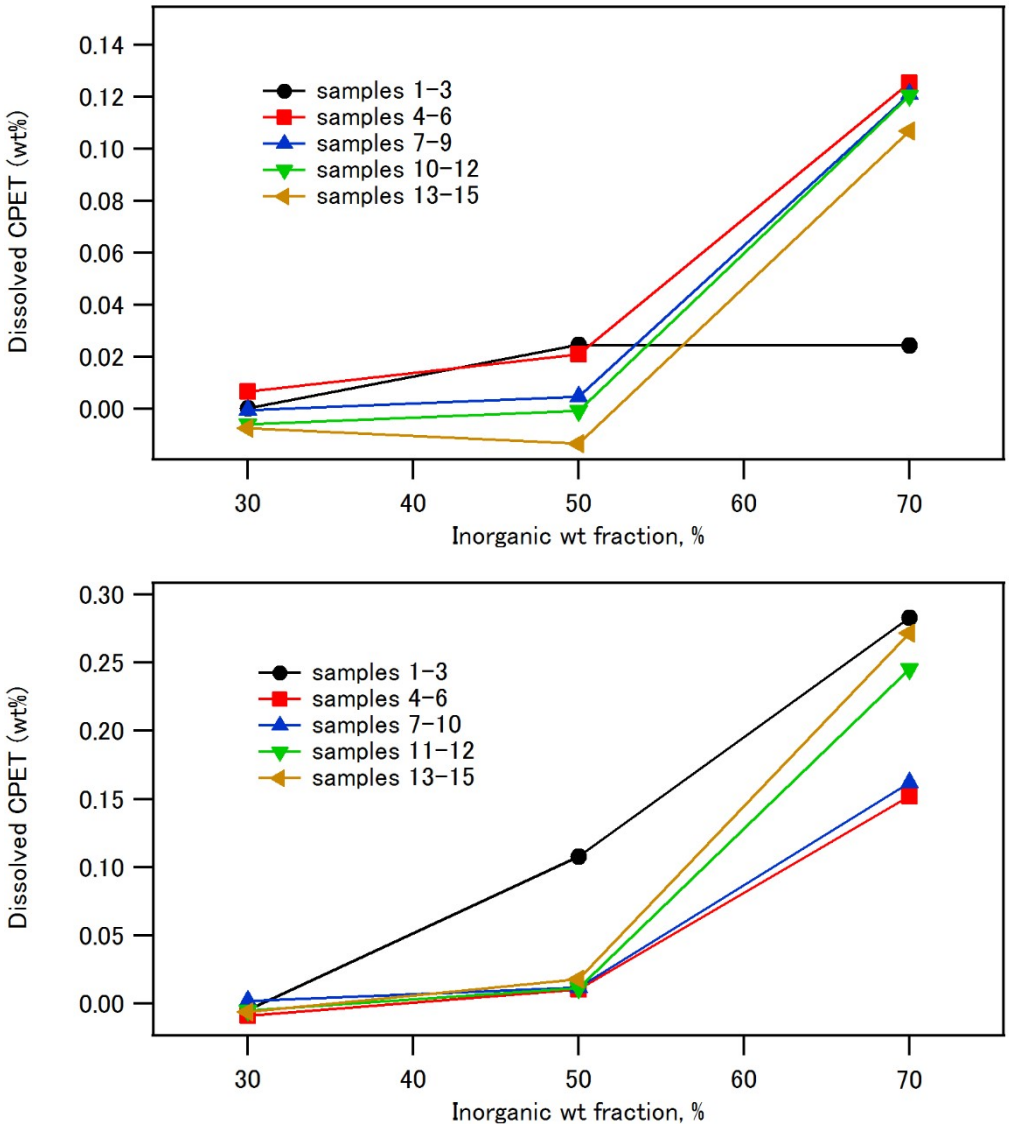
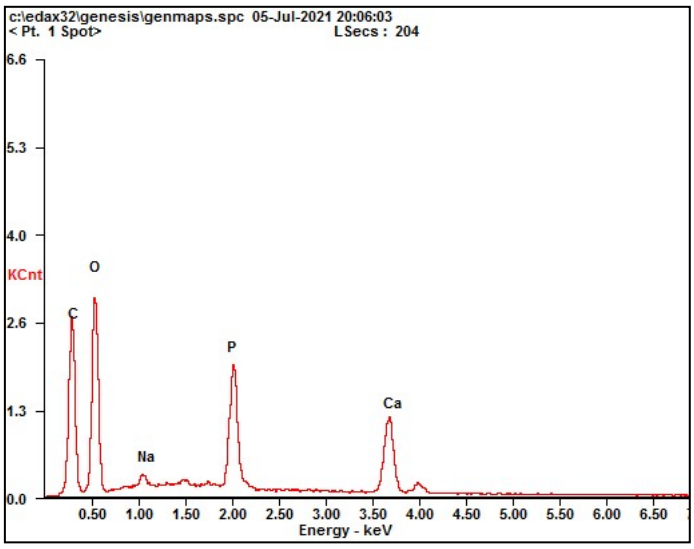


Figure S5. The weight % of CPET dissolved in water after immersion in water at room temperature for 24 h (a), and at 37 °C for 1 week, determined by UV-visible spectra of the water phase.

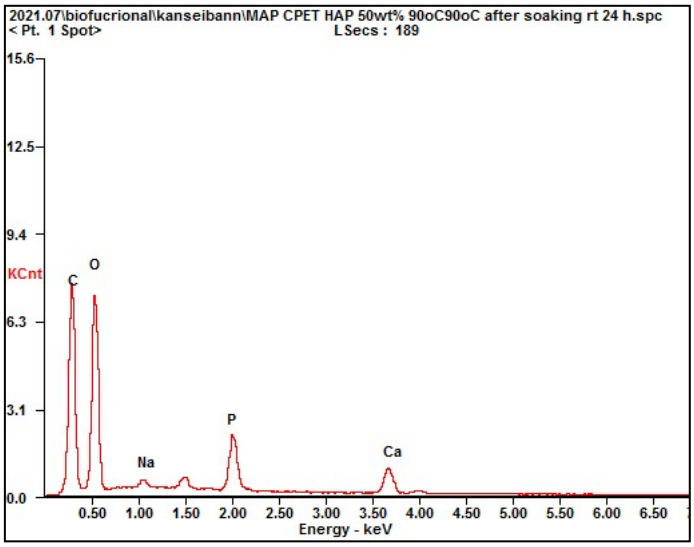
Table S1. Concentrations of CPET (mg/L) in the aqueous phase after immersion of the compacts in 20 mL water at room temperature for 24 h or at 37 °C for 1 week.

Sample	Room temperature, 24 h	37 °C, 1 week
1	0.01	0
2	0.9	4.1
3	0.7	8.4
4	0.3	0
5	0.8	0.4
6	3.3	4.0
7	0	0.1
8	0.2	0.4
9	3.3	4.4
10	0	0
11	0	0.4
12	2.8	6.2
13	0	0
14	0	0.6
15	2.7	6.8



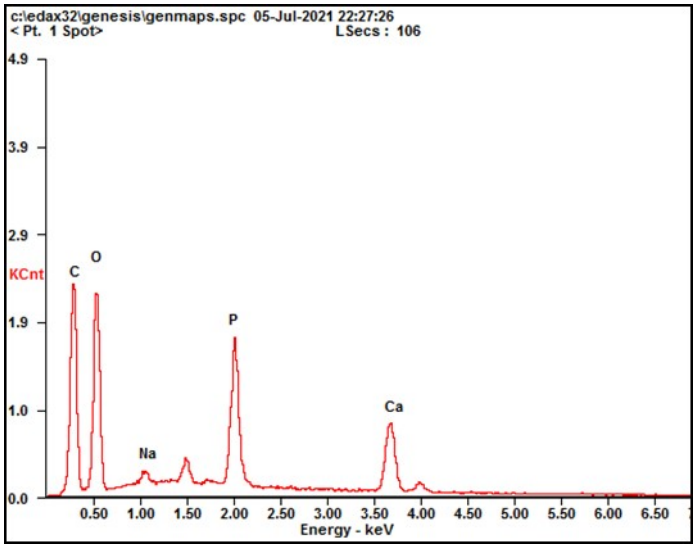
Element	*Wt%*	*At%*
CK	23.82	37.41
OK	34.16	40.27
NaK	01.21	00.99
PK	15.28	09.31
CaK	25.53	12.02
Matrix	Correction	ZAF

Figure S6. Energy dispersion spectra of the fracture surface of pristine sample 14.



Element	*Wt%*	*At%*
CK	35.49	47.25
OK	42.58	42.56
NaK	01.03	00.72
PK	09.75	05.03
CaK	11.15	04.45
Matrix	Correction	ZAF

Figure S7. Energy dispersion spectra of the fracture surface of sample 14 after immersed in water at room temperature for 24 h.



Element	*Wt%*	*At%*
CK	27.50	42.10
OK	31.74	36.48
NaK	01.21	00.97
PK	17.09	10.15
CaK	22.45	10.30
Matrix	Correction	ZAF

Figure S8. Energy dispersion spectra of the fracture surface of sample 14 after immersed in water at 37 ^{o}C for 1 week.

4. Mechanical properties of compacts after immersion in water.

Table S2. Mechanical properties and densities of the compacts after immersion in water at room temperature for 24 h.

Sample	density (g/cm^3)	Bending strain (%)	Bending strength (MPa)	Elastic modulus 1 (GPa)	Elastic modulus 2 (GPa)	Fracture energy (MJ/m^3)	N^b
1	1.331 ± 0.004	1.3 ± 0.1	15 ± 2	0.70 ± 0.03	1.6 ± 0.1	0.083 ± 0.008	3
2	1.54 ± 0.01	1.7 ± 0.1	14 ± 2	0.7 ± 0.3	1.0 ± 0.1	0.12 ± 0.03	3
3	1.82 ± 0.03	*a*	*a*	*a*	*a*	*a*	3
4	1.382 ± 0.008	1.8 ± 0.1	21.0 ± 0.2	1.0 ± 0.1	1.8 ± 0.2	0.19 ± 0.02	3
5	1.53 ± 0.03	1.6 ± 0.3	17 ± 1	0.8 ± 0.1	1.5 ± 0.1	0.12 ± 0.02	3
6	1.608 ± 0.009	*a*	*a*	*a*	*a*	*a*	3
7	1.376 ± 0.006	1.8 ± 0.3	22 ± 3	0.80 ± 0.04	1.7 ± 0.2	0.17 ± 0.05	3
8	1.597 ± 0.004	2.2 ± 0.1	25 ± 2	0.9 ± 0.2	1.8 ± 0.1	0.23 ± 0.03	3
9	1.73 ± 0.03	*a*	*a*	*a*	*a*	*a*	3
10	1.39 ± 0.01	1.4 ± 0.2	21 ± 1	1.1 ± 0.2	1.8 ± 0.3	0.130 ± 0.009	3
11	1.62 ± 0.02	2.0 ± 0.1	30 ± 1	1.1 ± 0.2	2.5 ± 0.1	0.26 ± 0.01	3
12	1.87 ± 0.02	1.0 ± 0.3	13.1 ± 0.5	1.2 ± 0.4	1.5 ± 0.2	0.06 ± 0.01	3
13	1.369 ± 0.007	2.4 ± 0.2	26 ± 2	0.46 ± 0.06	2.1 ± 0.2	0.232 ± 0.009	3
14	1.64 ± 0.02	2.8 ± 0.3	38 ± 2	0.55 ± 0.03	1.9 ± 0.1	0.45 ± 0.05	3
15	1.81 ± 0.01	*a*	*a*	*a*	*a*	*a*	3

a The compacts were collapsed after immersion in water, and a three point bending test cannot be carried out. b The number of determinations.

Table S3. Mechanical properties and densities of the compacts after immersion in water at 37 °C for 1 week.

Sample	density (g/cm^3)	Bending strain (%)	Bending strength (MPa)	Elastic modulus 1 (GPa)	Elastic modulus 2 (GPa)	Fracture energy (MJ/m^3)	N^b
1	1.38 ± 0.02	1.5 ± 0.1	13 ± 2	0.85 ± 0.08	1.20 ± 0.07	0.08 ± 0.02	3
2	1.56 ± 0.02	0.6 ± 0.2	5 ± 1	1.0 ± 0.1	1.0 ± 0.2	0.017 ± 0.009	3
3	1.82 ± 0.03	*a*	*a*	*a*	*a*	*a*	3
4	1.39 ± 0.02	1.6 ± 0.4	15 ± 3	0.8 ± 0.1	1.14 ± 0.09	0.11 ± 0.04	3
5	1.542 ± 0.001	0.13 ± 0.08	2 ± 1	0.6 ± 0.3	0.6 ± 0.3	0.002 ± 0.002	3
6	1.79 ± 0.03	*a*	*a*	*a*	*a*	*a*	3
7	1.378 ± 0.004	2.1 ± 0.2	15.4 ± 0.9	0.50 ± 0.05	1.03 ± 0.08	0.14 ± 0.01	3
8	1.587 ± 0.008	0.45 ± 0.05	4.6 ± 0.7	0.9 ± 0.1	0.9 ± 0.1	0.011 ± 0.003	3
9	1.830 ± 0.008	*a*	*a*	*a*	*a*	*a*	3
10	1.39 ± 0.01	1.54 ± 0.05	19 ± 1	0.68 ± 0.02	1.7 ± 0.2	0.123 ± 0.008	5
11	1.61 ± 0.02	1.2 ± 0.1	18 ± 1	1.1 ± 0.1	1.5 ± 0.1	0.10 ± 0.01	5
12	1.74 ± 0.03	*a*	*a*	*a*	*a*	*a*	5
13	1.371 ± 0.009	2.2 ± 0.2	22 ± 1	0.68 ± 0.06	1.50 ± 0.02	0.21 ± 0.03	3
14	1.60 ± 0.03	7.43 ± 0.05	22.0 ± 0.9	0.53 ± 0.04	0.18 ± 0.01	0.96 ± 0.01	3
15	1.79 ± 0.04	*a*	*a*	*a*	*a*	*a*	3

a The compacts were collapsed after immersion in water, and a three point bending test cannot be carried out. b The number of determinations.