Electronic Supporting Information (ESI)

Iron phosphate modified calcium iron oxide as an efficient and robust catalyst in electrocatalyzing oxygen evolution from seawater

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Figure S1 Overpotential (η) transients, recorded at an applied current density of 10 mA cm⁻², of (i) FTO|CaFeO_x|FePO_{4(t=12.5)}, (ii) FTO|CaFeO_x|FePO_{4(t=50)}, and (iii) FTO|CaFeO_x|FePO_{4(t=100)} in phosphate buffered (pH 7) synthetic seawater solution containing phosphate (0.5 M), NaCl (0.36 M), and MgCl₂ (0.07 M) under N₂ atmosphere.



Figure S2 XPS spectra of (i) $FTO|CaFeO_x$ and (ii) $FTO|CaFeO_x|FePO_{4(t=25)}$. (a) Fe 2p region. (b) O 1s region. (c) P 2p region.



Figure S3 (a) Cyclic voltammetry, recorded at a scan rate of 50 mV s⁻¹, and (b) Linear sweep voltammetry, recorded at a scan rate of 10 mV s⁻¹, of (i) unmodified and (ii) iron phosphate modified FTO in phosphate buffer (0.5 M, pH 7) under N₂ atmosphere. The appearance of redox couple in cyclic voltammetry (a) for iron phosphate modified FTO in phosphate buffer (t= 25s) confirms the formation of iron phosphate.¹



Figure S4 Linear sweep voltammetry, recorded at a scan rate of 10 mV s⁻¹, of (a) FTO|Co-Pi, (b) FTO|FeO_x, (c) FTO|CaFeO_x, and (d) FTO|CaFeO_x|FePO_{4(t=25)} in (i) phosphate buffer (0.5 M, pH 7), (ii) phosphate buffer (0.5 M, pH 7) containing NaCl (0.5 M), and (iii) phosphate buffered (pH 7) synthetic seawater solution containing phosphate (0.5 M), NaCl (0.36 M), and MgCl₂ (0.07 M) under N₂ atmosphere.



Figure S5 Evolution of O_2 at FTO|CaFeO_x|FePO_{4(t=25)} during CCE in phosphate buffered (0.5 M, pH 7) seawater solution. Current density 10 mA cm⁻² was applied only between 30 and 150 min (green and blue arrows indicate the beginning and end of CCE, respectively). The amount of O_2 was quantified with an O_2 fluorescence probe (black trace); the theoretical amount of O_2 with 100 % Faradaic efficiency is shown as a red trace.

References

(a)C. Y. Lin and C. T. Chang, *Sens. Actuators B-Chem.*, 2015, 220, 695-704; (b)F. Marken,
D. Patel, C. E. Madden, R. C. Millward and S. Fletcher, *New J. Chem.*, 2002, 26, 259-263.