Fluorine-Doped Tin Oxide Aerogel Support for Pt Catalysts: Enhancing Hydrogen Evolution Reaction via Sustainable Interface Engineering

Hyung-Ho Park[1,2+], Taehee Kim[1]

[1]*Department of Materials Science and Engineering, Yonsei University, Seoul 03722, Korea*

[2]*Aerogel Materials Research Center, Yonsei University, Seoul 03722, Korea*

[+]Author for correspondence: hhpark@yonsei.ac.kr

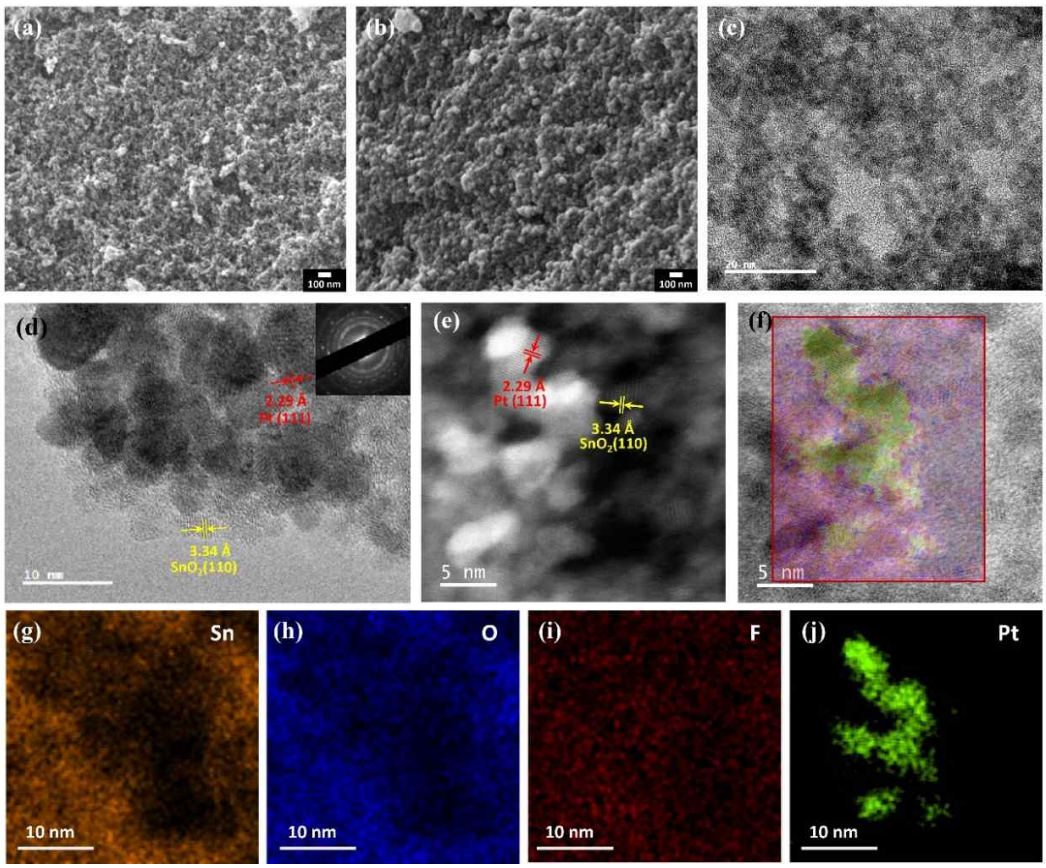

Fig. SEM images of the F-doped SnO_2 aerogel (a) before and (b) after the Pt deposition, (c) TEM image of the F-doped SnO_2 aerogel, (d) HRTEM image of F-SnO_2@Pt with two different interplanar spacings of SnO_2 and Pt, (e) HAADF-STEM image of F-SnO_2@Pt, showing Pt clusters on the F-SnO_2 aerogel matrix, with a bright field image of the same area. (f) EDX elemental mapping images of (g) Sn, (h) O, (i) F, and (j) Pt in F-SnO_2@Pt (all the F-SnO_2 structures represent 2 % F-SnO_2, unless otherwise stated).

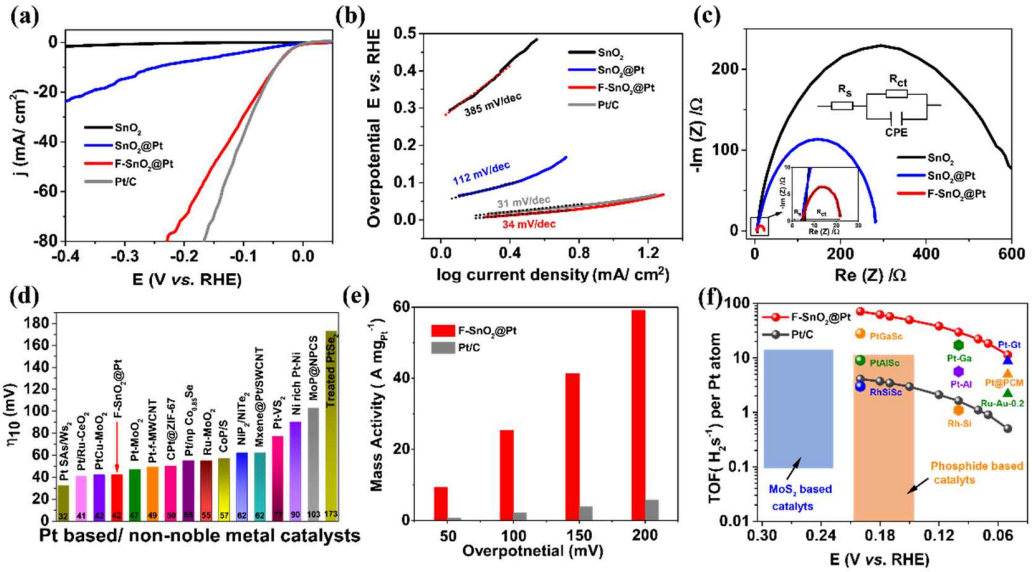

Fig. (a) Comparison of the electrochemical HER activities of SnO_2, SnO_2@Pt, F-SnO_2@Pt, and Pt/C. (b) Tafel slopes plotted from the corresponding linear sweep voltammetry curves. The dotted line indicates the linear-fitted region with its slope value. (c) Electrochemical impedance spectroscopy spectra with the equivalent circuit diagram shown in the inset. The smallest semicircle (fitted line) is observed in the F-SnO_2@Pt sample (inset). (d) Comparison of the overpotential (η_{10}) of F-SnO_2@Pt with those of previously reported high-activity catalysts. (e) Calculated mass activity and (f) TOF of F-SnO_2@Pt at different overpotentials.