Supporting Information

A facile and general preparation of high-performance noble-metal-based free-standing nanomembranes by a reagentless interfacial self-assembly strategy

Haoxi Wu, a,b Haili He, a,b Yujuan Zhai, a Haijuan Li, a Jianping Lai, a,b and Yongdong Jin a

a State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, Jilin, China.
E-mail: ydjin@ciac.jl.cn

b Graduate University of the Chinese Academy of Sciences, Beijing 100039, China

Figure S1. Histogram of size of Au, Ag, Pd, Pt NPs distribution of the Au-FNMs (a), Ag-FNMs (b), Pd-FNMs (c) and Pt-FNMs (d), respectively.
**Figure S2.** A typical UV-vis spectra of Au chain-like NPs in solution and when assemble into 2D nanomembranes (the Au1-FNMs) and transfer them onto a grass substrate.

**Figure S3.** TEM images of the Au nanomembranes prepared with the addition of different dosages of Na$_3$CA, (a) 0.15 mg, (b) 0.40 mg, (c) 0.60 mg.

**Figure S4.** Photograph of the as-prepared Au$_2$-FNMs floating on the solution surface of a 50 mL beaker (the reaction condition: 80°C, 3h) (a), TEM images of the as-prepared Au$_2$-FNMs (b-c).
**Figure S5.** Schematic of Au-FNMs which formed at the solid-water interface that can be transferred to the water-air interface when the temperature is above 80°C (a). TEM images of the as-prepared Au-FNMs at the solid-water interface with using different ligands, (b-c) Na₃CA, (d-e) CTAC.
**Figure S6.** Histogram of size of Ag/Au and Pd/Pt bimetallic NPs distribution of the Ag/Au –FNMs (a) and Pd/Pt-FNMs (b), respectively.