

Description of Additional Supplementary Files

Supplementary Movie 1. Generation and release of hydrogen bubbles on the NiMo-H₂ catalyst surface at different current densities in 1 M KOH.

Supplementary Movie 2. Generation and release of hydrogen bubbles on the nickel foam surface at different current densities in 1 M KOH.

Supplementary Movie 3. Generation and release of hydrogen bubbles on the NiMo-H₂ catalyst surface in the photothermal AEM electrolyzer at a current of 0.45 A in 6 M KOH seawater.

Supplementary Data 1. The atomic structures of different Ni, Mo, and O sites in the reaction process are listed in Supplementary Data 1.