Atomic layer deposition of Al₂O₃ was performed with TMA and H₂O on Fe₂O₃ substrates. The Al₂O₃-covered Fe₂O₃ photoanodes show enhanced photocatalytic performance, displayed by the decrease of overpotential by 0.2V. Previously, this effect was attributed by Le Formal et al. [1] to the passivation of surface states responsible for the decrease of photocarriers recombination rate.

We studied the ALD of Al₂O₃ on Fe₂O₃ with synchrotron radiation photoemission spectroscopy (SR-PES) and X-ray absorption spectroscopy (XAS), observing large modifications of Fe₂O₃ electronic structure after ALD, similarly to other systems [2]. These modifications suggest the occurrence of changes in the transport properties of photocarriers through the interface, explaining the lowering of overpotential.