

Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: 20 ps long non-biased trajectory of a hydroxide physisorbed on h-BN in water. The hydroxide, hydrogen, boron, nitrogen and oxygen atoms are respectively represented in cyan, white, orange, blue and red.

File Name: Supplementary Movie 2

Description: 20 ps long non-biased trajectory of a hydroxide physisorbed on graphene in water. The hydroxide, hydrogen, carbon and oxygen atoms are respectively represented in cyan, white, grey and red.

File Name: Supplementary Movie 3

Description: 500 fs long non-biased trajectory of a hydroxide initially chemisorbed on h-BN (left) or graphene (right) in water. The hydroxide, hydrogen, boron, carbon, nitrogen and oxygen atoms are respectively represented in cyan, white, orange, grey, blue and red.