We performed density functional theory study on the adsorption and decomposition mechanism of formic acid (HCOOH) on the close-packed Cu(111) surface, by using Perdew-Burke-Ernzerhof (PBE), PBE with dispersion correction (PBE-D2), and van der Waals density functionals (optB86b-vdW and rev-vdW-DF2). We found that the adsorption energy (E_{ads}) of single molecule HCOOH by using PBE functional is 0.25 eV, which is much smaller than the experimentally reported value of 0.55 eV for low coverage regime[3], while E_{ads}’s calculated using the vdW inclusive functionals are about 0.50-0.60 eV, in good agreement with experimental results, indicating the vdW correction is indispensable to describe the present system. On the other hand, the calculated activation barrier of HCOOH decomposition is almost independent of the vdW correction. The activation barrier of decomposition calculated by using PBE-D2 and vdw-DFs functionals are lower compared with adsorption energies, which are seemingly in contradiction with experimental findings, in which no decomposition of HCOOH on Cu(111) is observed when exposed to the gas phase HCOOH at room temperature. Therefore, we performed the reaction rate analysis based on the first principles calculations for desorption and decomposition processes to resolve this contradiction. The reaction rate analysis shows that the desorption rate of HCOOH is faster than that of its decomposition rate at higher temperatures, as seen in Figure 1. Hence, no decomposition of HCOOH should take place at room temperature.