**ABSTRACT**

The reaction of 4-hydroxy-4-methyl-2-pentanone (4H4M2P) with Cl atoms was studied for the first time experimentally and theoretically. Relative kinetic measurements were carried out at room temperature and 1 bar of synthetic air/N2 in two different environmental chambers: a 300 L Teflon bag and a 16 L borosilicate glass cell. Reactants, reference compounds and products were monitored either by IR absorption or by GC-FID. Theoretical calculations were performed using the density functional theory method at BH&HLYP level of theory for twelve hydrogen abstraction pathways. The individual rate coefficients for the most favorable H-abstraction pathways were calculated by canonical variational theory using small curvature tunneling method at 298 K. An average experimental rate coefficient of (7.4 ± 0.6) x 10-11 cm3 molecule−1 s−1 was obtained at 298 K, in good agreement with the theoretical rate coefficient. The branching ratios for each reaction channel were evaluated theoretically from the individual rate coefficients of the identified channels. The H-atom abstracted on the -CH2 group appeared to be the dominant channel with a small barrier height. Formaldehyde, acetic acid, HCl, CO2 and CO were identified by IR as the major primary products. The obtained results are presented and discussed in terms of structure-reactivity relationships. A mechanism is suggested for the formation of the observed products. The atmospheric implications of the studied reaction are presented and more particularly, the lifetime of 4H4M2P towards Cl atoms is evaluated to be about 3 days.