

## Answer on Question #71559 - Chemistry – Other

### Question:

What are the changes in pH when in a buffer solution of CH<sub>3</sub>COOH/CH<sub>3</sub>COONa you add 1) water 2) CH<sub>3</sub>COOH 3) CH<sub>3</sub>COONa 4) HCl.

### Answer:

Acidic buffer solutions are the solutions of weak acid and its salt. The equilibrium between the neutral and anionic form is the key of stable pH upon acid or base addition.

Thus, addition of relatively small amounts of water, HAc, NaAc and HCl will not change the pH considerably.

However, we can consider the weak changes that occur anyway upon addition of these substances.

#### 1). Water

Water addition will dilute the solution. Thus, the concentrations of Ac<sup>-</sup> and HAc will decrease, not changing the pH:

$$pH = 4.75 + \log \frac{[Ac^-]}{[HAc]}$$

When the dilution will become really high, the water auto ionization will play more and more significant role. Consequently, the pH will approach to 7.

#### 2). HAc

HAc addition will affect the equilibrium in the deprotonation reaction:



Upon addition of HAc the equilibrium will shift to the right, decreasing slightly pH of the solution.

#### 3) NaAc

Analogically to the HAc addition, the NaAc addition will affect the equilibrium of the reaction of deprotonation. Contrarily to HAc addition, the reaction equilibrium will shift to the left. Thus, the addition of NaAc will increase slightly the pH.

#### 4) HCl

HCl is a strong acid. Its addition will cause the protonation of the acetate anion, shifting the reaction of deprotonation to the left. Acetate anion concentration being unchanged, the pH of solution will slightly decrease.

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