Forecasts of halogen reactivity under the light of acid-base theory

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In spite of classic theory it is shown that haloform (trihalogenmethans) interactions with bases is controlled not by movability of the hydrogen of C-H bond, but by heterolysis of the C-halogen bond. For that reason, our acid-base theory regards the order of haloform reactivities (CHF$_3$<CHCl$_3$<CHBr$_3$<CHJ$_3$), which is experimentally observed, not as an anomaly but as a standard occurrence. According to some data, so-called $\alpha$-elimination starts on the stage of deprotonation[1], while other data point to the dissociation of the C-Hal bond as the first step.[2,3]

In light of general theory of acids and bases all reactions are viewed as acid-base and red-ox. During the interaction of the molecules of haloform with the base (sodium alcoholate) the atom of hydrogen of that C-H acid cannot play the role of the initiator of the reaction. The reason is obvious: there is a stronger Lewis acid(Na charge strength + 2.51)[4] in the reaction mixture than the C-H(charge strength +0.35) acid.In such a competition only the sodium atom can become the initiator of the reaction. Thereby, the attack of such a particle is always directed towards the halogen if C-Hal of the haloform, but not the hydrogen of C-H. According to the general acid-base theory, reaction is proceeding in the direction where the charge barrier is being most easily passed; thus, in the direction C-F, C-Cl, C-Br, C-I, as the heterolysis of the bond becomes easier.

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X_{\text{C-H}}=2.55-2.20=0.35, \quad X_{\text{F-C}}=3.98-2.55=1.43, \quad X_{\text{Cl-C}}=3.16-2.55=0.61, \quad X_{\text{Br-C}}=2.96-2.55=0.41, \\
X_{\text{J-C}}=2.66-2.55=0.11, \quad X_{\text{O-Na}}=3.44-0.93=2.51
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