Editorial on Carboxylic Acids and Derivatives

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DESCRIPTION

Dehydrohalogenation The presence of an electronegative heteroatom – commonly oxygen, nitrogen, or sulphur – linked directly to the carbonyl carbon distinguishes carboxylic acid derivatives from aldehydes and ketones. A carboxylic acid derivative can be thought of as having two sides.

Alkyl and/or aryl groups are attached to hydroxyl, alkoxyl, amino, and halo substituents, respectively, in the significant category of organic compounds known as alcohols, phenols, ethers, amines, and halides. When these functional groups are joined to an acyl group (RCO–), their characteristics are significantly altered, and they are referred to as carboxylic acid derivatives.

Carboxylic acids have a hydroxyl group attached to an acyl group, and their functional variants are made by substituents such as halo, alkoxyl, amino, and acyloxy replacing the hydroxyl group. Earlier, several examples of functional derivatives were shown.

The boiling points of several typical derivatives are listed in the table below. For comparison, an aldehyde and ketone of equivalent molecular weight are also included. The boiling points are given in torr (atmospheric pressure) and are stated as a range based on values found at lower pressures.

Because of substantial hydrogen linked dimerization, carboxylic acids have a relatively high boiling point. The first three compounds in the table demonstrate hydrogen bonding between molecules of 1-O and 2-O-amides (amides with at least one N–H bond).

Hydrogen bonded dimers and aggregates are not conceivable since the last nine entries in the preceding table cannot operate as hydrogen bond donors. Due to the high polarity of these functionalities, equivalent 3o-amides and nitriles have relatively high boiling temperatures. Indeed, if hydrogen bonding is absent, the boiling temperatures of similar-sized molecules are rather strongly correlated.

Three examples of acyl groups with distinct names have already been mentioned. These are frequently used in compound names. The IUPAC designations are color-coded in the instances below, and common names are supplied in parenthesis.

This is arguably the most important carboxylic acid derivative process. The following equation describes the total transformation, which can be characterized as either nucleophilic substitution at an acyl group or acylation of a nucleophile. For some nucleophilic reagents, the reaction may be referred to by a different name. When Nuc–H is water, the reaction is known as hydrolysis; when Nuc–H is an alcohol, the reaction is known as alcoholysis; and when Nuc–H is ammonia or amines, the reaction is known as aminolysis.

CONCLUSION

As shown in the qualitatively sorted list below, different carboxylic acid derivatives have extremely diverse reactivities, with acyl chlorides and bromides being the most reactive and amides being the least reactive. The difference in reactivity is striking. The reaction of acyl chlorides with water happens swiftly in homogenous solvent systems and does not require heating or catalysts. Amides, on the other hand, only react with water when powerful acid or basic catalysts are present, as well as external heating.