A carboxyl group is a functional group consisting of a carbon atom bonded to both an oxygen atom and a hydroxyl group (OH), represented as -COOH. It is also sometimes referred to as a carboxylic group.

The carboxyl group is commonly found in organic compounds known as carboxylic acids. Carboxylic acids are characterized by the presence of a carboxyl group at the end of a carbon chain or as part of a cyclic structure. The carboxyl group is responsible for the acidic properties of carboxylic acids, as it can donate a proton (H+) to a base.

The carboxyl group is involved in various chemical reactions and interactions. Here are a few key aspects:

Acidity: The carboxyl group is acidic due to the presence of the hydroxyl group. It can dissociate to release a hydrogen ion (H+) when exposed to a base. This proton donation is responsible for the characteristic sour taste and corrosive properties of carboxylic acids.

Hydrogen Bonding: The oxygen atom in the carboxyl group is highly electronegative, making it capable of forming hydrogen bonds with other molecules or functional groups. This hydrogen bonding contributes to the physical properties of carboxylic acids, such as their higher boiling points compared to similar-sized hydrocarbons.

Reactivity: The carboxyl group can participate in a range of chemical reactions. For example, it can undergo esterification, where the hydroxyl group reacts with an alcohol to form an ester. Carboxylic acids can also undergo decarboxylation, as discussed earlier, where the carboxyl group is removed as carbon dioxide.

Biological Significance: Carboxyl groups are important in biological molecules. For instance, amino acids contain a carboxyl group along with an amino group, and they are the building blocks of proteins. Fatty acids, essential components of lipids, also possess carboxyl groups.

The carboxyl group is a versatile functional group with widespread occurrence and significance in chemistry and biochemistry. Its presence in various compounds contributes to their chemical properties and plays a vital role in many biological processes.