



Parameter Fact Sheet – Phenols

In organic chemistry, **phenols**, sometimes called **phenolics**, are a class of chemical compounds consisting of a hydroxyl group (-OH) bonded directly to an aromatic hydrocarbon group. The simplest of the class is phenol, which is also called carbolic acid $\text{C}_6\text{H}_5\text{OH}$. Phenolic compounds are classified as simple phenols or polyphenols based on the number of phenol units in the molecule.

Phenolic compounds are synthesized industrially; they also are produced by plants and microorganisms, with variation between and within species.

Although similar to alcohols, phenols have unique properties and are not classified as alcohols (since the hydroxyl group is not bonded to a *saturated* carbon atom). They have higher acidities due to the aromatic ring's tight coupling with the oxygen and a relatively loose bond between the oxygen and hydrogen. The acidity of the hydroxyl group in phenols is commonly intermediate between that of aliphatic alcohols and carboxylic acids (their pK_a is usually between 10 and 12).

Loss of a positive hydrogen ion (H^+) from the hydroxyl group of a phenol forms a corresponding negative **phenolate ion** or **phenoxide ion**, and the corresponding salts are called **phenolates** or **phenoxides**, although the term **aryloxides** is preferred according to the IUPAC Gold Book. Phenols can have two or more hydroxy groups bonded to the aromatic ring(s) in the same molecule. The simplest examples are the three benzenediols, each having two hydroxy groups on a benzene ring.

Organisms that synthesize phenolic compounds do so in response to ecological pressures such as pathogen and insect attack, UV radiation and wounding. As they are present in food consumed in human diets and in plants used in traditional medicine of several cultures, their role in human health and disease is a subject of research. Some phenols are germicidal and are used in formulating disinfectants. Others possess estrogenic or endocrine disrupting activity.