

Physical properties of monocarboxylic acids.

Important physical properties of carboxylic acids are described below :

(1) **Physical state:** The first three members (upto 3 carbon atoms) are colourless, pungent smelling liquids. The next six members are oily liquids having unpleasant smell. The higher members are colourless and odourless waxy solids.

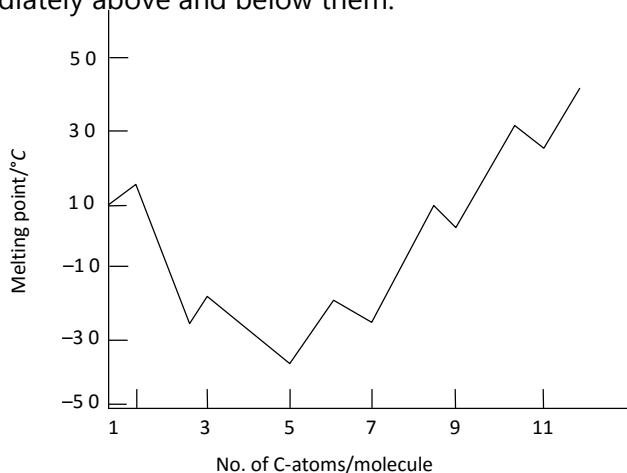
(2) **Solubility:** The lower members of the aliphatic carboxylic acid family (upto C_4) are highly soluble in water. The solubility decreases with the increase in the size of the alkyl group. All carboxylic acids are soluble in alcohol, ether and benzene etc.

Note: The solubility of lower members of carboxylic acids is due to the formation of hydrogen bonds between the $-COOH$ group and water molecules.

□ Acetic acid exists in the solution in dimer form due to intermolecular hydrogen bonding. The observed molecular mass of acetic acid is 120 instead of 60.

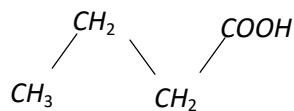
(3) Melting point

- (i) The melting points of carboxylic acids do not vary smoothly from one member to another.
- (ii) The melting point of the acids having even number of carbon atoms are higher than those containing an odd number immediately above and below them.

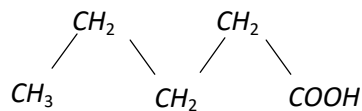


- (iii) The acids with even number of carbon atoms have the $-COOH$ group and the terminal $-CH_3$ group on the opposite side of the carbon chain.

(iv) In the case of odd numbers, the two groups lie on the same side of the chain.



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When the terminal groups lie on the opposite sides the molecules fit into each other more closely. More effective packing of the molecule in the lattice. Therefore, results into higher melting point.

(4) **Boiling point:** Boiling point of carboxylic acids increase regularly with increase of molecular mass. Boiling points of carboxylic acids are higher than those of alcohols of same molecular mass. This is due to intermolecular hydrogen bonding between two acid molecules.

