20.13: Physical Properties

Physical Properties of Some Carboxylic Acid Derivatives

Formula	IUPAC Name	Molecular Weight	Boiling Point	Water Solubility
$CH_3(CH_2)_2CO_2H$	butanoic acid	88	164 ºC	very soluble
$CH_3(CH_2)_2CONH_2$	butanamide	87	216-220 ºC	soluble
$CH_3CH_2CONHCH_3$	N-methylpropanamide	87	205 -210 ºC	soluble
$CH_3CON(CH_3)_2$	N,N-dimethylethanamide	87	166 ºC	very soluble
$HCON(CH_3)CH_2CH_3$	N-ethyl, N-methylmethanamide	87	170-180 ºC	very soluble
$CH_3(CH_2)_3CN$	pentanenitrile	83	141 ºC	slightly soluble
CH_3CO_2CHO	ethanoic methanoic anhydride	88	105-112 ºC	reacts with water
$CH_3CH_2CO_2CH_3$	methyl propanoate	88	80 ºC	slightly soluble
$CH_3CO_2C_2H_5$	ethyl ethanoate	88	77 ºC	moderately soluble
CH_3CH_2COCl	propanoyl chloride	92.5	80 ºC	reacts with water
$CH_3(CH_2)_3CHO$	pentanal	86	103 ºC	slightly soluble
$CH_3(CH_2)_2COCH_3$	2-pentanone	86	102 ºC	slightly soluble

The last nine entries in the above table cannot function as hydrogen bond donors, so hydrogen bonded dimers and aggregates are not possible. The relatively high boiling points of equivalent 3º-amides and nitriles are probably due to the high polarity of these functions. Indeed, if hydrogen bonding is not present, the boiling points of comparable sized compounds correlate reasonably well with their dipole moments.

Contributors

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