Polarity

From the above information on intermolecular interactions it follows that a simple distinction between *non-polar* and *polar* molecules is not sufficient. Instead we must distinguish between molecules that are **apolar** (i.e. neither H−bond donor nor H−bond acceptor), **monopolar** (either H−bond donor **or** H−bond acceptor), or **bipolar** (both H−bond donor **and** H−bond acceptor). A classification of a compound can usually already be done when its structural formula is known, for example:

- All compounds that contain an H−atom in form of a −OH or −NH group are H−bond donors.
- Compounds containing oxygen or nitrogen are strong H−bond acceptors.
- Compounds with pi−electrons are weak H-bond acceptors.

Table: Examples for the different abilities of organic compounds to interact by **van der Waals** and **H−bond** interactions.

apolar compounds	monopolar compounds		bipolar comp.[1]
only van der Waals interactions	van der Waals + H-bond acceptor (e-donor)	van der Waals + H-bond donor (e-acceptor)	van der Waals + H-bond donor + H-bond acceptor
alkanes chlorobenzenes[2] PCBs[2]	alkenes, alkynes, alkylaromatic compounds, ethers, ketones, esters, aldehydes	$CHCl_3$ CH_2Cl_2	$R-NH_2$ R_2-NH R − COOH R − OH

[1] Intramolecular H-bonds like in 2-nitrophenol strongly reduce the ability of the compound to form H−bonds with neighboring molecules.

[2] Compounds whose pi-electron density is diminished by electron withdrawing substituents are apolar.

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