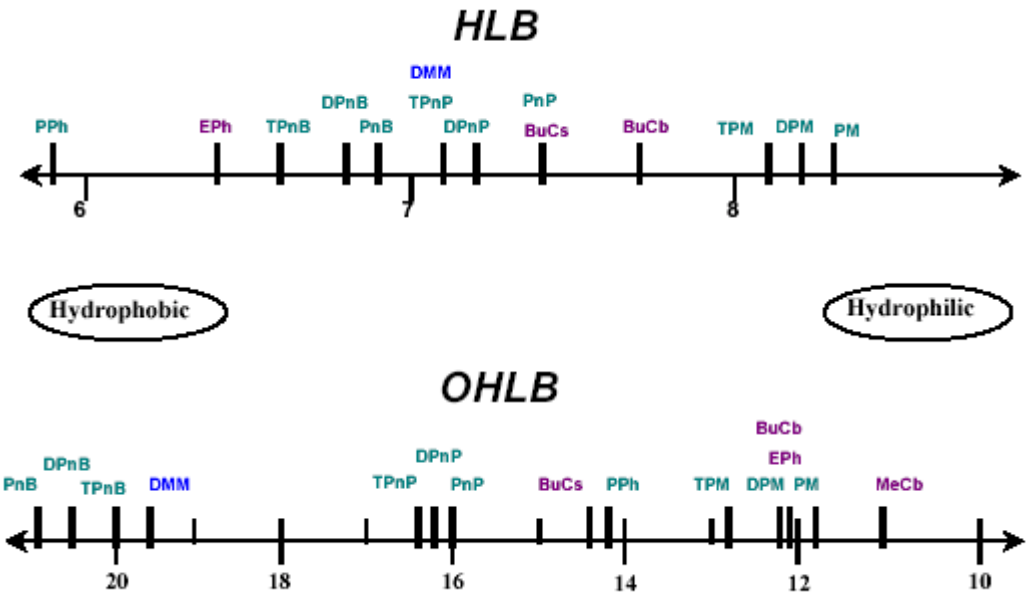
Solvent HLB and OHLB Values for DOW Glycol Ethers



Caption

HLB and OHLB1 values are useful for predicting some solvent properties. HLB is most useful for predicting a solvent's solubility in water, and OHLB is most useful for predicting oil/water partitioning of solvents. Please note that the two scales run counter each other with respect to hydrophilicity.

Discussion

Performance of solvents in aqueous systems can be predicted several ways, including Solvent HLB (hydrophilic-lipophilic balance) and solvent OHLB (organic hydrophilic-lipophilic balance) values. There are some distinct differences and advantages for using both scales.

The HLB scale was derived initially for surfactants and provides a means of comparing the relative hydrophilicity of amphiphilic molecules. HLB values are also relevant for solvents with pseudo-surfactant qualities, such as glycol ethers. Complete water solubility2 occurs at an HLB of about 7.3. Solvents with HLB values above this mark are completely miscible with water, while those below this value are only partially soluble in water. The HLB scale is most useful for visualizing the ease of compatiblizing solvents into water. PPh, at the far low end of the scale has the lowest water solubility and is most difficult to couple into water. Those in the middle, DMM, TPnP, DPnP have moderate solubility and easier to couple into water. PM at the other end of the scale has a much higher solubility and is miscible with water.

Solvent OHLB values are determined from partitioning experiments using water and a set of water immiscible model organic compounds. The OHLB trends are opposite to that of the HLB scale. In addition, the scale refers to a slightly different property, referring to how a solvent will partition in a multiphase aqueous system. The higher the solvent OHLB value the greater is its tendency to partition into the organic phase. The lower the solvent OHLB value, the greater its tendency to partition into the aqueous phase.

Solvents that lie close to each other on the scale are predicted to have the same partitioning, but not necessarily the same solubility characteristics. The solvent OHLB value and implied partitioning information must be used along with knowledge of the solvent's water solubility. For example BuCs and PPh glycol ethers have similar solvent OHLB values (~14), but have widely differing water solubility. BuCs glycol ether is completely water soluble and shows a strong affinity for both water and organics, making it a valuable coupling solvent for systems of this type. PPh, on the other hand, has a very limited water solubility. PPh has an equal, but very minimal, affinity for the aqueous and organic phases in these systems. This solvent strongly self-associates and tends to form a third, PPh rich, phase in water/organic systems.