

**Experimental Determination of Solvent Parameters:  
Solvato-Chromic, -Vibrational, -Magnetic, and -Calorimetric Comparison Methods (Invited)**

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The solvent parameters of about 200 non or weakly hydrogen-bond donor solvents are experimentally determined and discussed on the following grounds:

- One model definition system for each parameter. For example the  $\pi^*$  parameter must be defined from the longest wavelength  $\pi \rightarrow \pi^*$  transition of 4-nitroanisole at 298 K. Solute scales must not be mixed with solvent scales.
- A physical interpretation of each scale. The  $E_r$  scale measures mainly electrostatic forces, while  $\pi^*$  is a blend of dispersion, induction, and electrostatic forces. Most popular scales are internal energy based, not Gibbs energy based. One must take care of their use in correlating solvent effects on Gibbs energy properties.
- The use of comparison methods, based on chemical similarities and dissimilarities, in order to unravel hydrogen-bond from Van der Waals forces. The following ones will be presented and compared: solvatochromic (Kamlet-Taft), solvocalorimetric (Arnett, Catalan), solvatovibrational, and solvatomagnetic (this work).

Solvent parameters of hydrogen-bond donor solvents are more difficult to define. Results are presented for the hydrogen-bond basicity scale of alcohols. IR probes are compared to NMR probes for the  $\pi^*$  scale. Solvatochromic and solvocalorimetric comparison methods do not provide the same hydrogen-bond acidity scale.