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Bunnett–Olsen equations

The equations for the relation between $\log_{10}\left(\frac{[SH^+]}{[S]}\right) + H_0$ and $\log_{10}[H^+] + H_0$ for base S in aqueous mineral acid solution, where H_0 is Hammett's acidity function and $\log_{10}[H^+] + H_0$ represents the activity function $\frac{\log_{10}(\gamma_S \gamma_{H^+})}{\gamma_{SH^+}}$ for the nitroaniline reference bases to build H_0.

$$\log_{10}\left(\frac{[SH^+]}{[S]}\right) - \log_{10}[H^+] = (\Phi - 1)\,(\log_{10}[H^+] + H_0) + \mathrm{p}K_{SH^+}$$

$$\log_{10}\left(\frac{[SH^+]}{[S]}\right) + H_0 = \Phi\,(\log_{10}[H^+] + H_0) + \mathrm{p}K_{SH^+}$$

See also: Cox–Yates equation

Source:
PAC, 1994, *66*, 1077 *(Glossary of terms used in physical organic chemistry (IUPAC Recommendations 1994))* on page 1091

