

Chemical Phenomena at the Critical Point of Solution

James Baird^{C, S}

*Departments of Chemistry and Physics, University of Alabama in Huntsville, Huntsville, AL, U.S.A.
bairdj@uah.edu*

The principle of critical point universality is known to govern critical effects in physical phenomena such as superconductivity, superfluidity, and the liquid – vapor transition. Using a binary liquid mixture with a critical point of solution, we have shown that critical effects can also be observed in chemical phenomena as diverse as solubility, adsorption, and ion exchange. In order to observe a chemical critical effect at fixed temperature and pressure, no more than one composition variable can be fixed. The knowledge that temperature, pressure, and one composition variable are fixed can be ascertained in specific cases by application of the phase rule. In the case of three fixed variables, critical effects have been observed in more than 20 different experiments involving a wide variety of solids and solvent pairs.¹ There has been only one exception where the mixture used as the solvent has been non-aqueous. In the case of four fixed variables, critical effects are absent.¹

References

¹J. K. Baird, J. R. Lang, X. Wang, A. Mukherjee, and P. Norris, *J. Phys. Chem. B* **123**, 5545 – 5554 (2019).