

Letters

Chemical Speciation and Calculation of pH of a Sport Drink

Recently an interesting laboratory project "Chemical Speciation Analysis of Sport Drinks by Acid–Base Titrimetry and Ion Chromatography: A Challenging Beverage Formulation Project" has been described by H. Drossman (1). This author uses an Excel spreadsheet to obtain a distribution diagram as function of pH from the analytical concentrations C_{Cit} , C_{PO_4} , and C_{K} . Based on the pointer function (2), the pH and the equilibrium concentrations of the citrate and phosphate species are calculated. This procedure allows students to see that the pointer function has a minimum value at the solution pH. However, the resolution of the pointer function requires the plotting the logarithmic concentration diagram, which is time-consuming and tedious.

I propose a fast and accurate method based on Mathcad (3, 4) to solve the same example presented by Drossman, that is, a Powerade sample of analytical concentrations $C_{\text{Cit}} = 0.0125$ M, $C_{\text{PO}_4} = 0.000239$ M, and $C_{\text{K}} = 0.0032$ M. The Mathcad application is provided in the online supplement. The agreement is good between the evaluated pH value with Mathcad, pH = 2.831, and the value obtained from pointer function, pH = 2.85 ($\text{pH}_{\text{Exp}} = 2.85$, $\text{pH}_{\text{Rep}} = 2.82$).

Literature Cited

1. Drossman, H. J. *Chem. Educ.* **2007**, *84*, 124–127.
2. Freiser, H. J. *Chem. Educ.* **1994**, *71*, 297–299.
3. Mathsoft: Cambridge, MA, 2002. <http://www.ptc.com/appserver/mkt/products/home.jsp?k=3901> (accessed Dec 2007).
4. Holler, F. J. *Mathcad Applications for Analytical Chemistry*; Saunders College Publishing: New York, 1994.

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<http://www.jce.divched.org/Journal/Issues/2008/Mar/abs371.html>

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Supplement

Mathcad document for chemical speciation and calculation of pH for Powerade

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