

## Comments

### Comments on "Liquid–Liquid Equilibria in (2,3-Butanediol + 2-Butoxyethanol + Water + Potassium Chloride) at 70 °C" (Escudero, I.; Cabezas, J. L.; Coca, J. *J. Chem. Eng. Data* 1996, 41, 1383–1387)

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Escudero, Cabezas, and Coca (1996) on page 1385 stated that tie-line data have also been correlated by the Eisen–Joffe equation (Eisen and Joffe, 1966)

$$\log\left(\frac{w_{1o}}{w_{2o}}\right) = (A + B100w_s) + (C + D100w_s) \log\left(\frac{w_{1w}}{w_{3w}}\right) \quad (1)$$

where  $w_{1o}$  and  $w_{1w}$  are the mass fractions of component 1 in the organic and aqueous phases respectively,  $w_s$  is the mass fraction of KCl in the initial (quaternary) mixture, and  $A$ ,  $B$ ,  $C$ , and  $D$  are constants. In the light of the description given below, one can easily conclude that Escudero et al. (1996) have misunderstood the Eisen–Joffe equation (Eisen and Joffe, 1966).

Having found that the intercept,  $A'$ , and the slope,  $C'$ , of the Hand equation

$$\log\left(\frac{w_{1o}}{w_{2o}}\right) = A' + C' \log\left(\frac{w_{1w}}{w_{3w}}\right) \quad (2)$$

vary linearly with salt concentration, Eisen and Joffe (1966) proposed an equation for correlating the data of a quaternary system containing three liquids and a salt

$$\log\left(\frac{w_{1o}}{w_{2o}}\right) = (A + Bw_s') + (C + Dw_s') \log\left(\frac{w_{1w}}{w_{3w}}\right) \quad (3)$$

where  $w_s'$  is the salt concentration expressed as mass % in the initial (binary) aqueous salt solution. Therefore data of a quaternary system containing a salt, on application of eq 1 or eq 3 should yield a unique set of values of  $A$ ,  $B$ ,  $C$ , and  $D$ , irrespective of salt concentration (expressed either as  $w_s$  in eq 1 or  $w_s'$  in eq 3) and also should yield two correlation coefficients,  $r$ , (for each quaternary system): one with regard to intercept and salt concentration and the other in correlating the slope with salt concentration. We obtained the following results on application of the Eisen–Joffe equation, eq 1, to Escudero et al.'s data:

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$$\begin{array}{lll} A = 0.146\ 22 & B = 0.023\ 81 & r = 0.637\ 64 \\ C = 0.888\ 45 & D = 0.034\ 96 & r = 0.867\ 17 \end{array}$$

These values are, evidently, different from those given in Table 2. Though Table 2 is titled as "Eisen–Joffe Correlation Constants and Regressions", the reported constants and coefficients in Table 2 are for the Hand equation, eq 2 only, and not for the Eisen–Joffe equation, eq 1. Now the fact is that Escudero et al. (1996) have not at all used the Eisen–Joffe equation but used only the Hand equation. Instead of verifying the linear relationship between the intercept/slope of eq 2 with salt concentration, the authors simply superimposed the linearity and calculated  $B$  and  $D$  (for  $w_s > 0$ ) from the following relationships:

$$B = (A_{w_s > 0} - A_{w_s = 0})/100w_s \quad \text{and} \quad D = (C_{w_s > 0} - C_{w_s = 0})/100w_s$$

The reported values for  $B$  and  $D$  are in error.

There appear to be some errors in Vainerman et al.'s correlation constants, especially with regard to eq 5 and eq 6. Table 4 should contain

| amt of KCl/mass % | eq 4  | eq 5  | eq 6  |
|-------------------|---|---|---|
| 0.43              | $a = 0.1696$<br>$b = 0.4373$<br>$r = 0.9798$  | $c = 0.3427$<br>$d = 482.8996$<br>$0.8023$  | $e = 1.1892$<br>$f = 1077.4386$<br>$0.7990$ |
| 3.03              | $a = -0.2107$<br>$b = 0.4017$<br>$r = 0.9709$ | $c = -0.1784$<br>$d = 128.4491$<br>$0.9203$ | $e = 0.0397$<br>$f = 324.8367$<br>$0.9630$  |

#### Literature Cited

- Eisen, E. O.; Joffe, J. Salt Effects in Liquid–Liquid Equilibria. *J. Chem. Eng. Data* 1966, 11, 480–484.  
Escudero, I.; Cabezas, J. L.; Coca, J. *J. Chem. Eng. Data* 1996, 41, 1383–1387.

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