We are gratified that Nakayama evidently does not dispute the derivation in our note (1). Our original objection to the statement by Nakayama that “obviously different solubility product constants [of calcium sulfate] are possible depending on whether \([\text{Ca}]_{\text{total}}\) or \([\text{Ca}^{2+}]\) is used” (4) was that it is based on using Debye-Hückel (DH) theory activity coefficients in conjunction with stoichiometric concentrations. It is certainly true that this will generally result in differences. Obviously only one of the procedures can be correct. However, it is not the use of stoichiometric concentrations per se that is incorrect. It is the use of stoichiometric concentrations in conjunction with the DH theory without correcting for ion-pairs, in solutions where a significant proportion of the total ions are paired that is incorrect. One can measure perfectly sound activity products without ever considering explicitly the presence of ion-pairs in solutions.

The calcium sulfate example used in our note was based on work by Fosbinder (2). Fosbinder’s use of the DH theory to establish a reference activity is perfectly valid provided that the solution is dilute enough. It appears that a small error may have resulted in the establishment of a reference activity due to the presence of ion-pairs. The activity coefficients calculated by Fosbinder subsequent to the establishment of a reference activity are clearly stoichiometric activity coefficients. It would appear that these activity coefficients are fairly accurate as judged by the excellent agreement between the activity products for calcium sulfate given in our note.

We did not mean to imply in our note that work such as that of Moreno and Osborn (3) in which explicit recognition of ion-pairing was made is irrelevant. In fact we think quite the opposite. What we sought to demonstrate was that there exist in the literature sound thermodynamic data for solutions even though ion-pairing may not have been considered explicitly in the calculation of activity products.

**Literature Cited**


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