DATE:

Solubility

How would you determine the Solubility product of a sparingly soluble salt?

Solubility of a Sparingly Soluble Salts and its determination.

There are a number of Salts such as AgCl, $BaSO_4$, $PdSO_4$ etc. which are sparingly soluble in water that their solubility can-not be determined by any chemical method. Therefore they are regarded as insoluble salts. The method depending upon the conductivity measurement is however proved very useful in determining even extremely small solubility of the Salts.

It may be determined by repeatedly washing of the salt conductivity water to remove any soluble impurities and then suspending it in conductivity water 25°C. A little amount of the salt will be dissolved and the rest will settle at the bottom. The specific conductivity is then determined as usual by placing the conductivity cell in the thermostate maintained at

25°C. Let the value be K_v.
Now, since the solubility of the salt is extremely low, a very small amount of salt will be present in the large solution. It may be regarded that it will be almost completely dissociated into ions so that the value of λ_v will be the same as λ_∞ in this case i.e.

$$\lambda_v = \lambda_\infty = K_v \times V$$

V = Volume in cc containing 1 gm equivalent of the insoluble salt.
λ_∞ may be calculated by summing up the two ionic mobilities as

$$\lambda_\infty = \lambda_a + \lambda_c$$

Thus K_v and λ_∞ the value of V can be calculated and from which the solubility of sparingly soluble salt is determined as follows.

V c.c. of the solution contains = 1 gm eq. of salt.
1000 c.c. of the solution contains = $\frac{1}{V} \times 1000$ gm

$$= \frac{1000}{V} \times E \text{ gm/litre of salt/litre}$$

Solubility, $w = \frac{1000 \times E}{V}$ gm/litre
[E = Equivalent of the insoluble salt]

But $\lambda_\infty = K_v \times V$ or $V = \frac{\lambda_\infty}{K_v}$

$$w = \frac{1000 \times E \times K_v}{\lambda_\infty}$$