



Principle of Common-ion Effect and its Application in Chemistry: a Review

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ABSTRACT

Common-ion effect is a shift in chemical equilibrium, which affects solubility of solutes in a reacting system. The phenomenon is an application of Le-Chatelier's principle for equilibrium reactions that has become a regular occurrence in chemistry analysis and industrial researches. It is an important phenomenon that can be used in practice, to understand some reaction conditions that could favour an increased product formation. In Chemistry, its principle is thought to rely on its ability to exploit the availability of an ion present in each of the reacting compounds in a reacting system to suppress the solubility of one of the ionic substances upon contact with another ionic compound. Due to the precipitating effect of the presence of common-ions in equilibrium solutions, the common-ion effect is considered one of the factors that affect the solubility of a compound. The principle of common-ion effect applies in many chemical processes including those involved in buffering solutions, purification of salts, salting out of soap, precipitation of salts, manufacture of baking soda, water treatment and are frequently applied in many manufacturing industries including the pharmaceutical industries. In this paper, we performed a concise updated desk literature review on the principle of Common-ion effect with the view to provide a greater understanding of the concept and its importance in chemistry.

1. Introduction

The effect of common-ions in equilibrium solutions is an important and interesting aspect in chemistry and other studies relating to chemical equilibrium. The common-ion effect is a term used to refer to the decrease in the solubility of a salt that occurs when the salt is dissolved in a solution that contains another source of one of its ions [1]. It is a regular occurrence in chemical analysis and plays significant role on solubility and the dissolution rate of salts. It is also described as a phenomenon in which the degree of dissociation of any weak electrolyte can be suppressed by adding a small amount of strong electrolyte containing a common-ion [2]. The concept describes a shift in equilibrium caused by the addition or removal of one of the compounds, which takes part in the equilibrium [3]. The presence of Common-ion generally affects the solubility of salts and other weak electrolytes because it basically decreases the solubility of a solute as the ionization of a weak acid or weak base is decreased by any

strong electrolyte that provides a common ion [4].

And since the solubility of solids that contain common ions with solvent is lower than solubility in pure solvents [4], Silver trioxonitrate (iv) AgNO_3 salt for instance, is said to be more soluble in pure water than it is in Sodium trioxonitrate (iv) NaNO_3 because they have the nitrate ion (NO_3^-) in common.

However, this effect cannot be observed in the compounds of transition metals as they have a tendency to form complex ions [5]. But it can be observed in the compounds insoluble in water. This is because the addition of a common-ion can prevent the ionization of the weak acid or weak base as much as it would without the added common ion. Furthermore, common-ion effect can be observed in such reactions involving the decrease in the solubility of the salt in a solution that already contains an ion common to that salt [5].

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