2012 年臺灣國際科學展覽會

優勝作品專輯

國家：South Korea

編號：120020

作品名稱

A Study For Heavy Metals Detection Using The Solubility change of Different Kinds Solute

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Abstract

A research on how a solution mixed with two or more solutes affect the solubility of each solute was done. If different solutes are put in a solution with a specific concentration, the solubility of the single state solute increases, stays the same, or decreases. The difference in solubility caused by several solutes will give solutions on selectively collecting heavy metals from bodies of water polluted by these heavy metals even more effectively.

To test the changes in the solubility of the solution with several solutes, sedimentation has been used; however, colorimetric analysis was also done to observe the changes in color of solutes that show color in the solution.

Nitrate compounds of Sodium, Magnesium, Strontium and Potassium were used for the typical metals, and for the transition metals, nitrate compounds of Silver, Cadmium and Lead were used.

Test results show that Sodium decreased the solubility of Lead, and as the concentration of Sodium increased, the solubility of Lead increased too.

Concentration of NaNo3	0.01M	0.02M	0.03M	0.04M
Abs(nm)(peak)	1.8599(298.4)	2.5377(297.6)	2.6239(298.5)	2.9597(296.5)
Concentration	0.9841M	1.317M	1.360M	1.525M

On the other hand, K increased the solubility of Pb, and as the concentration of K increased, the solubility of Pb decreased.

Concentration of $Ca(NO_3)_2$	0.01M	0.02M	0.03M	0.04M
Abs(nm)(peak)	3.6123 (296.4)	3.4362 (296.2)	3.3424 (298.4)	3.155 (298.2)
Concentration	1.846	1.759	1.713	1.621

We can use the radius of ions and the enthalpy of hydration to explain the changes in solubility.

In the case of Cd, as the concentration of K, Mg and Sr increase, the solubility of Cd increased with it. This is because the difference between the ionic radii of Cd and the other ions (K, Mg, Sr) has a tendency to increase in solubility in the enthalpy of hydration. Also, as the concentration of Ca increased, there was a tendency in which the solubility of Cd decreased. This is because the ionic radii of Cd and Ca are similar to each other and there was a tendency that the solubility decreased in the enthalpy of hydration.

Through this experiment, the study shows the tendency of the change in solubility of several solutes by comparing ionic radius and the enthalpy of hydration, and if this result is used, the processing of certain heavy metals in the bodies of water can be even more effectively used than the previous method.

評語

本研究是利用重金屬離子在溶液中，會因加入其他鹽類而改變其溶解度，來設計一套去除重金屬之方法。本研究頗具創意。