

Sunan Payungsak 2012: Preparation of Intercalation Compound

$[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite and Application as Potentiometric Sensor.

Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry.

Thesis Advisor: Associate Professor Ladda Meesuk, Ph.D. 135 pages.

In this work, we studied the use of intercalation compound  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite as a potentiometric sensor to measure anions in aqueous solution.

The  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite was prepared by solid-solid reaction, between Ca(II)-bentonite and 2,2'-bipyridine at a molar ratio 1:3. The formation of  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$  in the interlayer space of bentonite was confirmed by powder X-ray diffraction (powder XRD), bonding vibrations of 2,2'-bipyridine in  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite were studied by Fourier Transform Infrared spectrophotometer (FT-IR). The existence of 2,2'-bipyridine in bentonite was confirmed by analysing the C:N ratio of the product compared with that of 2,2'-bipyridine molecule. The surface morphology of Ca(II)-bentonite and  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite was observed by Scanning electron microscope (SEM) and thermal stability of the  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite was studied by using Thermogravimetric analyzer (TGA). The potentiometric electrode was constructed by mixing  $[\text{Ca}-(2,2'\text{-bipyridine})_3]^{2+}$ -bentonite with artificial graphite, carboxymethyl cellulose (CMC) and polytetrafluoroethylene (PTFE) in a ratio 0.2: 0.025: 0.4: 0.3 by weight. It was found that the sensor gave best response to  $\text{S}^{2-}$  when compared with other anions, graphs of  $\log[\text{S}^{2-}]$  vs voltage (mv) gave a slope 29.84 which was closed to theoretical value, 29.5, following Nernst equation. The linear concentration range was  $10^{-4}$ - $10^{-1}$  M ( $3.2$ -  $3.2 \times 10^3$  ppm) of  $\text{S}^{2-}$ . The electrode can be used to determine  $\text{S}^{2-}$  in water samples by direct method and standard addition method.

---

Student's signature

Thesis Advisor's signature