MWCNT, silver nanoparticles, CuBTC를 사용한 염소 이온 센서 합성

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초 록: Quantitative measurement of chloride ion concentration has an important role in various fields of electrochemistry, medical science, biology, metallurgy, architecture, etc. Among them, its importance of architecture is ever-growing due to unexpected degradations of building structure. These situations are caused by corrosion of reinforced concrete (RC) structure of buildings. And chloride ions are the most powerful factors of RC structure corrosion. Therefore, precise inspection of chloride ion concentration must be required to increase the accuracy of durability monitoring.

Multi-walled Carbon nanotubes (MWCNTs) have high chemical resistivity, large surface area and superior electrical property. Thus, it is suitable for the channels of electrical signals made by the sensor. Silver nanoparticles were added to giving the sensing property. CuBTC, one of the metal organic frameworks (MOFs), was employed as a material to improve the sensing property because of its hydrophilicity and high surface area to volume ratio.

In this study, sensing element was synthesized by various chemical reaction procedures. At first, MWCNTs were functionalized with a mixture of sulfuric acid and nitric acid because of enhancement of solubility in solution and surface activation. And functionalized MWCNTs, silver nanoparticles, and CuBTC were synthesized on PTFE membrane, one by one. Electroless deposition process was performed to deposit the silver nanoparticles. CuBTC was produced by room temperature synthesis. Surface morphology and composition analysis were characterized by scanning electron microscope (SEM), energy dispersive X-ray spectroscopy (EDS), respectively. X-ray photoelectron spectroscopy (XPS) was also performed to confirm the existence of sensing materials. The electrical properties of sensor were measured by semiconductor analyzer. The chloride ion sensing characteristics were confirmed with the variation of the resistance at 1 V.