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MXENE BASED COLORIMETRIC SENSOR FOR SILVER ION DETECTION IN WATER

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These days, silver can be found in a variety of materials, such as jewellery, electronics, pharmaceuticals and many more. Unfortunately, a large amount of this element finds its way into the environment and gets exposed to living organisms. Although silver is known for its antibacterial properties, ionic silver has been shown to be mildly toxic to aquatic organisms and is known to have detrimental effects on the human body. That is why finding a reliable way to detect silver ions in drinkable water is important.

Lately, a novel two-dimensional (2D) transition metal carbide/nitride material group has garnered a large amount of attention for its excellent properties, such as high chemical stability, high electrical conductivity, and environment-friendly characteristics. Their hydrophilic nature and sizeable surface area render enes potent adsorbents for many molecular or ionic systems. This work will show how a nanoplasmonic sensor composed of Ti_3C_2Tx MXenes could be used to detect a small amount of Ag^+ in the water supply.

For this investigation, intermediate Ti_3C_2Tx MXenes and different Ag^+ concentrations were mixed in buffer (pH = 3, 4, 5, 6), distilled water and tap water mediums. A spectrophotometer was used to measure the sensor's signals. This investigation shows that buffer solution interferes with Ag^+ reduction, causing a significant signal depression and a red shift from 450 nm to 650 nm compared to measurements done in distilled water. MXenes show a strong adsorption affinity and readily react with collateral ions found in the solution; consequently, better results are obtained when distilled water is used. However, this sensor shows a sufficient result when used in more natural conditions like tap water. A linear correlation between Ag^+ concentration and MXene absorption signal could be seen. Finally, we show that this sensor has the potential to be reiterative.

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