

Title: Manganese Electrochemical Detection in Drinking Water

Abstract:

Manganese (Mn) is a drinking water contaminant that can originate from natural geological sources in groundwater and surface water or be introduced through water treatment processes. Although Mn was previously only considered as an aesthetic issue, recent epidemiologic evidence suggests that excessive exposure can cause negative neurological impacts, especially in children. In Canada, a new drinking water guideline (2019) and regulations have been introduced to address the new health concerns. However, the nature of Mn events in drinking water distribution systems can be sporadic and difficult to predict, with conventional detection methods being limited in their ability to provide flexible in-line Mn monitoring (e.g., ICP-MS and GFAAS), due to their high capital cost and long turn-around time. Therefore, there is an urgent need for methods that are rapid, portable, and low-cost, which could be introduced to our water distribution systems at multiple locations for in-line and/or on-site monitoring. We have explored several electrochemical and mechanical sensing methods towards addressing the requirements such as sensitivity, robustness, and speed of detection. Some of our proof-of-concept designs have shown promises. These new methods form a foundation for further development of tools for Mn monitoring.