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Photonic Sensors

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# ppb-Level Heavy Metal Ion Detection by Electrochemistry-Assisted NanoPorous Silicon (ECA-NPS) Photonic Sensors

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## Highlights

- Nanoporous silicon (NPS) based 1D microcavity structures are fabricated simply by electrochemical etching, to enhance surface reactions, thus providing high sensitivity.
- The use of the NPS based 1D microcavity structures, in combination with long electrochemical reduction technique, provides a high selectivity and an ultra-low LOD for matters in water.
- This combined technique is applied to detect heavy metal ions (cadmium  $\text{Cd}^{2+}$  in our particular case) in DI and lake water. The result demonstrates a sensitivity of 342 nm/RIU, and LOD of 0.152 ppb in DI water and 1.16 ppb in lake water. The selectivity of  $\text{Cd}^{2+}$  is obtained over other metal ions available in the lake water such as sodium ( $\text{Na}^+$ ), potassium ( $\text{K}^+$ ), magnesium ( $\text{Mg}^{2+}$ ), calcium ( $\text{Ca}^{2+}$ ), nickel ( $\text{Ni}^{2+}$ ).

## Abstract

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