

## **Advanced Engineering of Nanoporous Photonic Crystals for Environmental Diagnosis**

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### **ABSTRACT**

Heavy metal ions are extremely persistent contaminants that cannot be degraded by conventional treatments, and bioaccumulate in humans and wildlife. Exposure to heavy metal ions is a critical threat to our environment and health. Conventional analytical techniques have limitations (low selectivity, long processing times, high costs, cross-contamination, low throughput) that severely constrain our ability for efficient detection of heavy metals in the environment. We urgently need advanced diagnostic technologies to guide and maximise heavy metal remediation efforts. Current progress in nanotechnology is enabling development of analytical tools for quantitative and qualitative on-site screening of heavy metals. The rational design and precise engineering of highly selective surface chemistries and materials at the nanoscale will be a major advance in addressing this urgent need. But bench-to-bedside translation of fundamental proof-of-concept studies will require micro- and nanomanufacturing approaches that are fully scalable, cost-competitive and compatible with or complementary to existing analytical technologies – to minimise technological translation costs and create comprehensive environmental profiles of heavy metal ions. Here I will introduce different combinations of chemically modified photonic crystal structures and their on-chip integration to engineer analytical tools for reliable on-site analysis of heavy metal ions.