

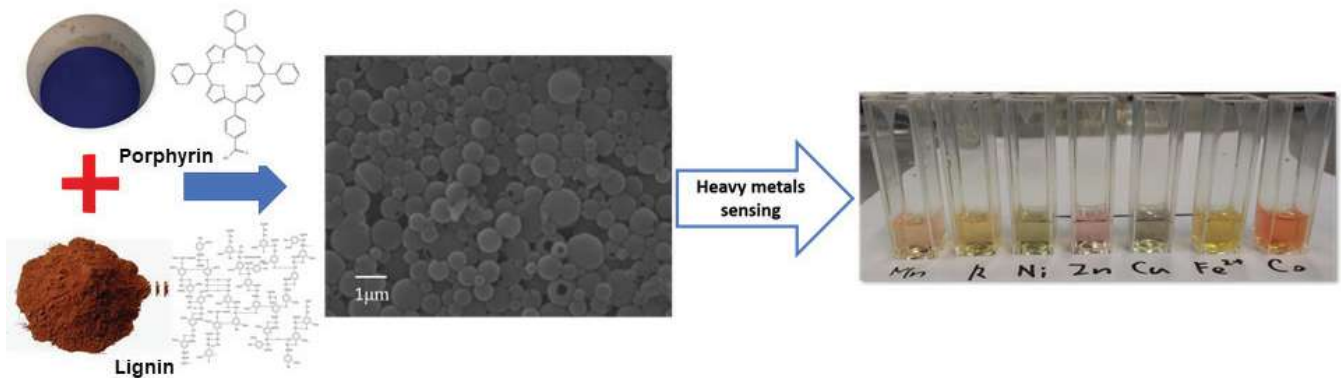
Green Nano-polymer for Fast Screening of Heavy Metals

綠色納米聚合物 有助快速重金屬檢測

Shao-Yuan (Ben) LEU, Ph.D., P.E, Department of Civil and Environmental Engineering

Special features 技術特點

- ▶ *Rapid heavy metals sensor (including Co, Cu, Mn, Ni & Zn) via UV-vis spectroscopy*
快速檢測出水中不同類型的重金屬 (包括：鈷，銅，錳，鎳和鋅)
- ▶ *The sensitivity can cover the heavy metal concentration ranges in water from 10 ppm to 500 ppm*
靈敏度可以覆蓋水中重金屬濃度範圍從10 ppm到500 ppm



Porphyrin and its families are widely applied in various commercial products like chemical sensors, bio-imaging agents and cancer drugs. These products are usually applied with synthetic and petroleum-based polymers as the building block. During the incorporation with porphyrin, a complex procedure is involved while hazardous chemical reagents are always created.

In this prototype, a natural plant-based polymer (Alkali lignin) is applied for incorporation with Porphyrin. The produced biorefinery-derived Lignin-porphyrin Nano-polymer (Lignin-TPP) demonstrated remarkable performance and contain outstanding feature which cannot be provided by the original chemicals alone. It can be served as a rapid sensor to detect different types of heavy metals via simple UV-vis spectroscopy ($R^2=0.99$). In comparison with porphyrin, the emission intensity of Lignin-TPP is significantly enhanced (>50 folds) in high-water fraction (>90%) environments with broad pH range. Therefore, it showed the potentials in bio-imaging application due to its stable and intense emission at a broad range of pH.

This technology demonstrated an example of effective utilizing lignin to fabricate a new functional material and offering significant benefits to waste valorization and industries.

卟啉(或紫質)及其相連的化物廣泛應用於各種商業產品，如化學傳感器，生物成像劑和抗癌藥物。現有的生產程序較為複雜，把合成和石油基聚合物與卟啉結合，往往產生對環境有害的化學試劑。理大團隊發明了以造紙業所生產的固體殘餘物—木質素為基質，利用一鍋合成法跟卟啉連接起來。此聚合物通過紫外—可見光譜可快速檢測出水中不同類型的重金屬。靈敏度可以覆蓋濃度範圍相對廣和線性準確度相對高。另外，新發明的聚合物在寬廣酸鹼值和高水分的環境中的螢光強度十分高，有助於生物成像的應用。此發明既環保又多功能，為業界展示成功典範。



Contact Us
Ir Steven Lam, Manager
Innovation and Technology Development Office
T (852) 3400 2864
E steven.tf.lam@polyu.edu.hk



www.polyu.edu.hk/itdo