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Bisphenol detection: Screen-printed electrode comparison for rapid, cost-effective monitoring

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Endocrine-disrupting chemicals (EDCs) pose significant health hazards, impacting metabolic, reproductive, and respiratory functions. Thermal paper, commonly used in receipts and tickets, contains Bisphenol A (BPA) and Bisphenol S (BPS), a concerning EDC that can easily migrate to the skin, where it disrupts the endocrine system by mimicking the estrogen hormone, so negatively influencing human health [1,2]. Given its toxicity and widespread use, there's a pressing need for analytical methods to detect EDCs like bisphenols. Screen-printed electrodes (SPEs) offer a cost-effective solution for real-time monitoring. This study compares SPEs with carbon nanoparticles (CNPs) and carbon single-wall nanotube electrodes (SWCNTs) for BPA and BPS detection. It demonstrates their sensitivity, repeatability, and suitability for rapid, low-cost detection without hazardous waste generation. SEM was employed to examine the surface of the working electrodes of SPEs. The specificity of the SPE sensors in simultaneously detecting BPA and BPS was evaluated using differential pulse voltammetry (DPV), as depicted in Figure 1. SPE electrodes based on single-wall nanotubes demonstrated a broader linear range (0.5 to 75.0 µM) and higher sensitivity towards BPA and BPS oxidation than those with carbon nanoparticles. However, due to reduced capacitive current, CNP-based SPEs exhibited a 15-fold lower limit of detection (LOD) for BPA and a 4-fold lower LOD for BPS than SPE based on SWCNTs. These findings suggest that screen-printed electrodes based on carbon materials are promising techniques for on-site and health risk assessments in various everyday scenarios.

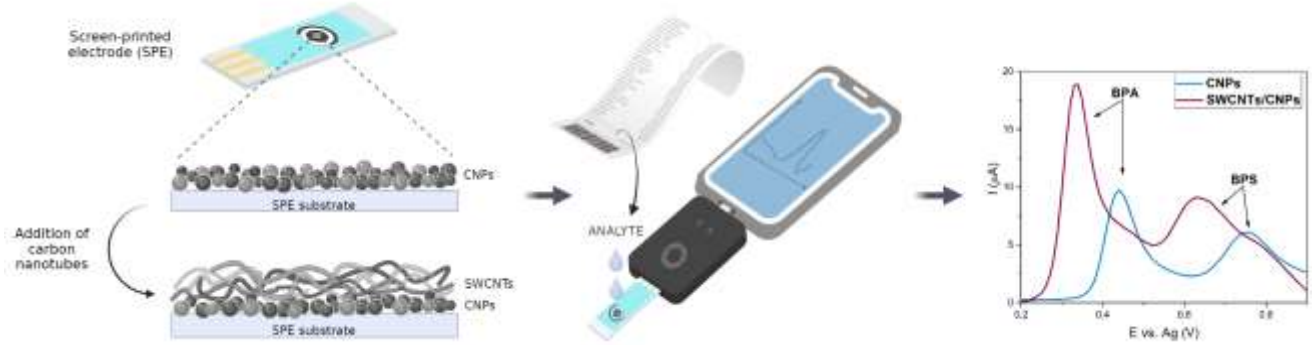

Figure 1. Comparison detection of BPA and BPS by SPE based on carbon nanoparticles and single-wall nanotubes via DPV [3]

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