Abstract

Project Title: Development of on-mobile and on-site colorimetric sensor for methamphetamine detection

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This project successfully developed a powerful simple, real-time, and on-mobile quantitative analysis of methamphetamine using an application installed on the mobile phone. The Simon presumptive color test was used in combination with the ColorAssist app on an iPhone to detect methamphetamine. A sol-gel colorimetric sensor was also successfully developed for the detection of methamphetamine (MA). Simon's reagents were entrapped within the polymeric network of the sol-gel matrix. The sol-gel MA sensor was fabricated within a micro-PCR tube to which the sample solution could be directly added for in-tube detection. This resulted in a small and easy to carry sensor. The sensor was used to demonstrate the rapid quantitative analysis of MA in illicit methamphetamine tablets (Yaba) in conjunction with digital image colorimetry using the ColorAssist which has been reported as an accurate and precise method. Real-time Red-Green-Blue (RGB) basic color data of the colorimetric product from the sensor was obtained using an application installed on a mobile phone. The concentrations of MA detected in the illicit tablets by the sol-gel sensor were comparable to values obtained from gas chromatograph-flame ionization detector (GC-FID) analysis. Method validation indicated good precision both intra- and inter-day (0.85 to 2.41% and 1.76 to 4.51%, respectively). The sensor was also applied to spiked urine samples and low relative errors in the range of +4 to -9% were obtained. The sol-gel sensor was capable of being stored for almost 3 months (84 days) in a freezer (-18°C) with only a +4.89% change in the results compared to analysis carried out on the day of preparation. These results demonstrate that the sol-gel MA sensor has the potential to be used as a colorimetric sensor for MA detection in a variety of media. When the sensor was used in combination with a color analysis application installed on a mobile phone, it provided an ideal novel platform for the rapid quantitative analysis of MA.