

Chapter 7: Smartphone based analytical chemistry: current trends and future perspectives

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Abstract: Over the past few years, smartphones have developed much more than what they were during the era when they were used as communication gadgets. They have now come to be seen as the potent instruments in the areas of analytical chemistry because they are cheap, mobile, and user friendly. Compared to traditional lab equipment, which can be cumbersome and expensive, smartphones can be used by a very broad range of people, and even those in a resource-deprived environment. They have cameras, microphones, sensors, GPS, and wireless connectivity built in and thus enabling them to gather, process, and relay information with extraordinary effectiveness. Chemical sensing is one of the most likely uses of smartphones in analytical chemistry. Smartphones can detect changes in the colorimetric properties of solutions using simple attachments or even the built-in camera of the phone, which allows measuring such parameters as pH, glucose level, and even the existence of heavy metals. Not only is it cheaper, but also does not require any specialized training, thus chemical analysis is more accessible. In addition to pure sensing, the use of smartphones in spectroscopy and fluorescence is being used more. Smartphones with low-cost optical accessories and miniature light sources are capable of making absorbance, reflectance, or emission measurements of the types that are typically done on benchtop spectrophotometers. The techniques are especially helpful with point of care testing, medical diagnostics, food quality control, and environmental monitoring, and where quick and accurate measurements are necessary. The other significant benefit of smart phones is their computing power. They also have the high data-processing capability that allows real-time analysis, recognition of images, and quantitative interpretation of the data. As the concept of artificial intelligence (AI) and machine learning (ML) is merged, the smartphones will become even more flexible in their data processing, forecasts, and automated decision-making process. This would transform the personalized medicine, clinical diagnostics, and the large-scale surveillance of the environment.

Keywords: Smartphone, Analytical Chemistry, Artificial intelligence (AI), machine learning (ML), sensor.