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Particulate matter monitoring – past, present and future

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The health problems caused by exposure to airborne particulate matter (PM) beyond safe limits has been studied for many years. Government regulatory agencies have adapted and updated the safe exposure limits as more progress is made both in policy developments and detection system design. Bulky PM detectors, though very accurate do not provide sufficient spatial and temporal resolution, are static and expensive. Current much smaller commercial PM sensors are mobile but still mostly too expensive and largely still too big for real-time continuous personal use. They also must be calibrated to convert their counts to mass concentration despite their variation from unit to unit. The continuous drive towards having a cheaper, smaller, yet more effective PM sensors for personal exposure analysis and indoor environments is pushing the current boundaries of current techniques. Emerging PM sensing techniques must now achieve this, while also linking to other structured source apportionment and semantic analysis of air quality data aimed at providing useful information about user activities mostly provided via the internet. This review highlights works on PM detection and monitoring, covering history, theory, methods and principle of operation of detection instruments, large and small scale source apportionment, instrument calibration processes and performance evaluation techniques, emerging trends and future outlooks. Further, this work reviews PM_{2.5} detection and its challenges, assumptions in measurement interpretation and possible solutions going forward.

Biography

Pelumi W Oluwasanya is a PhD student at the University of Cambridge. He is supervised by Dr. Luigi Occhipinti, with Prof. Rod Jones as Co-supervisor. His current research interests include air quality monitoring, and printable sensor technologies for monitoring air pollution. He has a BSc (Hons.) degree in Electrical Engineering from Olabisi Onabanjo University, an MSc in Signal Processing from The University of Edinburgh and has recently completed a Master of Research (MRes) degree in Sensor Technologies and Applications. He is an IEEE Member.

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