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Optical and electrical properties of bacteria were based on bio-detector for heavy metals (CdCl₂ and NiCl₂) pollutants

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Environmental pollution can be defined as any discharge of material or energy into water, land and air, that causes adverse changes to the Earth's ecological balance, or that lowers the quality of life. One of the most dangers contaminations are the heavy metals, which are commonly referred to as trace metals; many trace metals are highly toxic to humans (e.g. Hg, Pb, Cd, Ni, As, Sn) and other living organisms in the environment. There are many techniques used for detection of heavy metals, for example; AAS, ICP-MS and Chromatography. In this project, the bio-cell sensor that included the microorganisms bacteria (*E. coli* and *D. radiodurans*) was employed for detection of heavy metals, which is considered to be a cheap (cost effective), simple (easy to use), powerless (portable) and sensitive technique. Characterisation of bacteria samples were carried out using a variety of experimental techniques, i.e. optical methods including optical density measurements, UV-vis spectrophotometer, fluorescent microscopy and spectroscopy for studying light scattering in bacteria samples, and electrical methods both DC and AC are used. The results of the optical methods appeared to be completely different of bacteria response and did not correlate with the (Live/Dead) bacteria ratio, which are due to the effect of (Cd²⁺, Ni²⁺) ions on light scattering. The electrical technique was used to study the effect of heavy metals (CaCl₂ and CaCl₂) on bacteria. The effect of metal salt appeared to be comparable on both *E. coli* and *D. radiodurans* bacteria. AC and DC properties of electrochemical solutions that contained *E. coli* and *D. radiodurans* bacteria were studied, and the results were compared to and normalised to the results of samples not mixed with metals. Comparative figures can be used to estimate metal concentration and the effect of metal on bacteria.

Biography

M Al-Shanawa completed his PhD in 2014 at Sheffield Hallam University (UK), under the supervision of Prof. Alexie Nabok in MERI. He published more than 7 papers and attended about 9 global conferences in UK, France, Croatia, Jordan and Iraq.

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