ANALYSING HEAVY METALS USING LASER INDUCED BREAKDOWN SPECTROSCOPY TECHNIQUE

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requirements for the award of the degree of
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This thesis is specially dedicated to:

My beloved parents,
Badruzzaman bin Hamzah, Zaiton bt. Hitam

My supportive siblings,
Ammar, 'Umar and Fathymah

My dedicated lecturers,

and all my friends.

.....thanks.....

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ABSTRACT

Analyzing heavy metals in polluted water using conventional method by chemical technique is difficult because sample preparation involves a lot of chemical. As an alternative to overcome the drawback, laser induced breakdown spectroscopy is introduced. The aims of this project is to analyze heavy metals commonly found in sea water using a q-switched Nd:YAG laser. The laser was focused using two lenses, concave lens was used to diverge the beam and then bring to merge by camera lens with wide angle of 28 mm focal length. An optical breakdown occurred associated with plasma formation at the focal point. Heavy metal sample comprised of solid form and powder. The powder sample was deposited on glass slide by PVD technique. The heavy metal sample was located at the focal point in the air and exposed by laser in repetitive mode with frequency of 10 Hz. The plume plasma formation on the metal sample was visualized using CCD camera. The spectrum produced after laser-metal interactions were recorded via spectrum analyzer. The line spectra were manifested on the screen and analyzed by comparing to data base. Each line represents the element contained in the tested metal. The highest signal indicates the major element contains from the tested heavy metal. Finally, the analyzed heavy metals were summarized in a histogram for comparison purposes.

ABSTRAK

Menganalisis logam berat dalam air tercemar dengan menggunakan kaedah konvensional dengan teknik kimia adalah sukar kerana perlu menyediakan sampel dan melibatkan pelbagai bahan kimia. Sebagai alternatif untuk mengatasi masalah ini, laser mengaruhkan runtuhan spektroskopi diperkenalkan. Matlamat projek ini adalah untuk menganalisis logam berat biasanya dijumpai dalam air laut menggunakan q-suis laser Nd: YAG. Laser ditumpukan menggunakan dua kanta, satu kanta cekung bergabung dan lensa kamera yang mempunyai sudut lebar dan panjang focus 28mm. Satu runtuhan optik berlaku diikuti dengan pembentukan plasma pada titik fokus. Sampel logam berat terdiri daripada bahan pepejal dan serbuk. Sampel serbuk telah dienapkan di atas slaid kaca melalui teknik PVD. Sampel logam berat yang diletakkan dalam titik fokus di udara dan didedahkan dengan laser dalam mod berulang-ulang dengan frekuensi 10 Hz. Pembentukan gumpalan plasma atas sampel logam dirakam menggunakan kamera CCD. Spektrum yang dihasilkan selepas interaksi laser-logam telah dirakamkan melalui penganalisis spektrum. Garis spektrum telah dimanifestasikan pada skrin dan dianalisis dengan membandingkan dari pangkalan data. Setiap garis mewakili elemen yang terkandung dalam logam yang diuji. Isyarat tertinggi menandakan elemen utama yg dikandungi oleh logam berat yang diuji. Akhirnya logam berat yang dianalisis disenaraikan dalam histogram untuk tujuan perbandingan.