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Investigation of Pulsed Mode Operation in Low Temperature Arsenic Plasma Light Sources

In this work we investigate arsenic-containing high-frequency electrodeless lamps (HFEDLs). Such light sources are often used in atomic absorption spectroscopy (AAS), as they provide the necessary narrow and intense spectral lines, stability and long lifespan. Additionally, arsenic discharge lamps have potential applications in disinfection because the arsenic spectrum in the far ultra violet region includes three resonance lines at 189.0 nm, 193.7 nm, and 197.3 nm. While HFEDL use in AAS demands, that radiation emission of the light source is continuous and with negligible fluctuations, for disinfection applications pulsed irradiation mode has been proven to be more effective.

We have found that arsenic electrodeless lamps may be operated in a pulsed mode under certain preparation and working conditions. In this study, we investigate the behavior of arsenic lamps in the pulsed mode focusing on thermal data. We used thermal camera to record temperature changes during the pulse mode, and obtained data for several excitation generator voltage values.

Our results showed that pulse period depends on voltage, as it decreases with higher voltage values. Temperature difference between maximum and minimum values was about 80 degrees. We also observed that the radial distribution accross the central diameter of the lamp was not even. Due to the skin effect, temperature in the lamp center was lower than closer to the lamp walls.

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