Investigation of Hg resonance 184.9 nm line in a capillary low-pressure discharge

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In the last decade, growing interest has been directed to the capillary light sources. From a practical point of view, this interest is stimulated by their potential applications in various microsystems and portable devices, for instance, such light sources are used in portable LUMEX Mercury analyzer.

Most of the absorption spectrometers for Mercury determination in air are using spectral line of Hg at 253.7 nm, however the sensitivity of analyzer could be improved by using spectral line of Hg at 184.9 nm.

Data about structure of this resonance line in dependence on the cold spot temperature can be used not only for the lamp diagnostics but also for the validation of different type of calculations and models, considering radiation trapping. The radiation trapping effect plays an important role in light source devices using resonance radiation and it is important for the calculation of radiation efficiency and luminous output. The sensitivity of atomic absorption spectrometer is dependent both on intensity of emission source spectral line, as well as on profile of line, in particular self-absorption is of interest.

One of the investigation directions was targeted towards finding the optimal temperature regime for 184.9 nm light source. We produced a setup for thermostabilization of lamp "cold spot" and performed intensity measurements of Mercury 184.9 nm spectral line in temperature range from -5 to +40°C for lamps with different fillings.

The results of this investigation allows us to conclude that it will be necessary to thermostabilize the analyzer 184.9 nm light source at temperature at or below +15°C, though the final decision will be dependent on the overall thermal regime of the whole resulting device, when assembled.

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