

## The influence on Grimm-type discharges in argon of oxygen traces, either as an added gas and as a sample constituent.

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The effects of added oxygen gas on the analytical glow discharges (GD) -, significant changes on electrical characteristics, and emission intensities of both analyte and carrier gas (usually Ar) – have been shown experimentally [1,2] and predicted by computer models [3]. However, the experimental studies were either limited to one of two spectral lines for each element, or used oxygen concentrations far higher than those likely in analytical work. These changes can seriously affect both the stability of the discharge and the analytical results. Contamination by oxygen traces can be curtailed by using high purity carrier gas, modern vacuum techniques and “clean” instrument. However, the complexity of discharge processes is far greater when oxygen traces are present in the sample either as constituent such as Fe<sub>2</sub>O<sub>3</sub>, Ti<sub>2</sub>O<sub>3</sub> and Al<sub>2</sub>O<sub>3</sub> or within an alloy.

The investigations were carried out in three separate locations - at Imperial College (IC), London, EMPA, Thun and IFW, Dresden. Optical spectra generated in pure Ar and Ar/O<sub>2</sub> plasmas have been recorded using the IC high resolution vacuum UV Fourier transform spectrometer allowing for the first time a detailed study of the effects on a large number of energy levels; these spectra have been compared, again for the first time, with spectra from an calamine sample (hot rolled alloy steel with oxide layer) in a pure Ar plasma. A Specturma GDA650 instrument was used to record time-resolved spectrochemical information during the analysis of calamine. Glow discharge time of flight mass spectrometry (GD-TOFMS) experiments were carried out at EMPA with both iron and iron oxide samples. Changes in emission intensities and ion signals of both analyte and carrier gas will be reported and discussed.

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[3] A. Bogaerts, *Spectrochim. Acta, Part B*, 2009, **64**, 1266-1279.