SUMPLEMENTARY INFORMATION

A ceramic microchip with LDA-APGD as the excitation source for OES – a sensitive Hg detecting sensor for microsamples analisis

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Overview: Supplementary information presents comparison of emission spectra of mch-LDA-APGD acquired within 0.5 s after ignition of the discharge for a solution containing 1 mg L^{-1} of Hg and a blank solution. (Fig. ESI-1), in addition to the background corrected intensity profile of the Hg 253.7 nm atomic emission line in function of evaporation time (Fig. ESI-2). It also presents information about construction costs of single michrochip production and temperature/electrical conductivity specification of the Au paste used as an electrode.

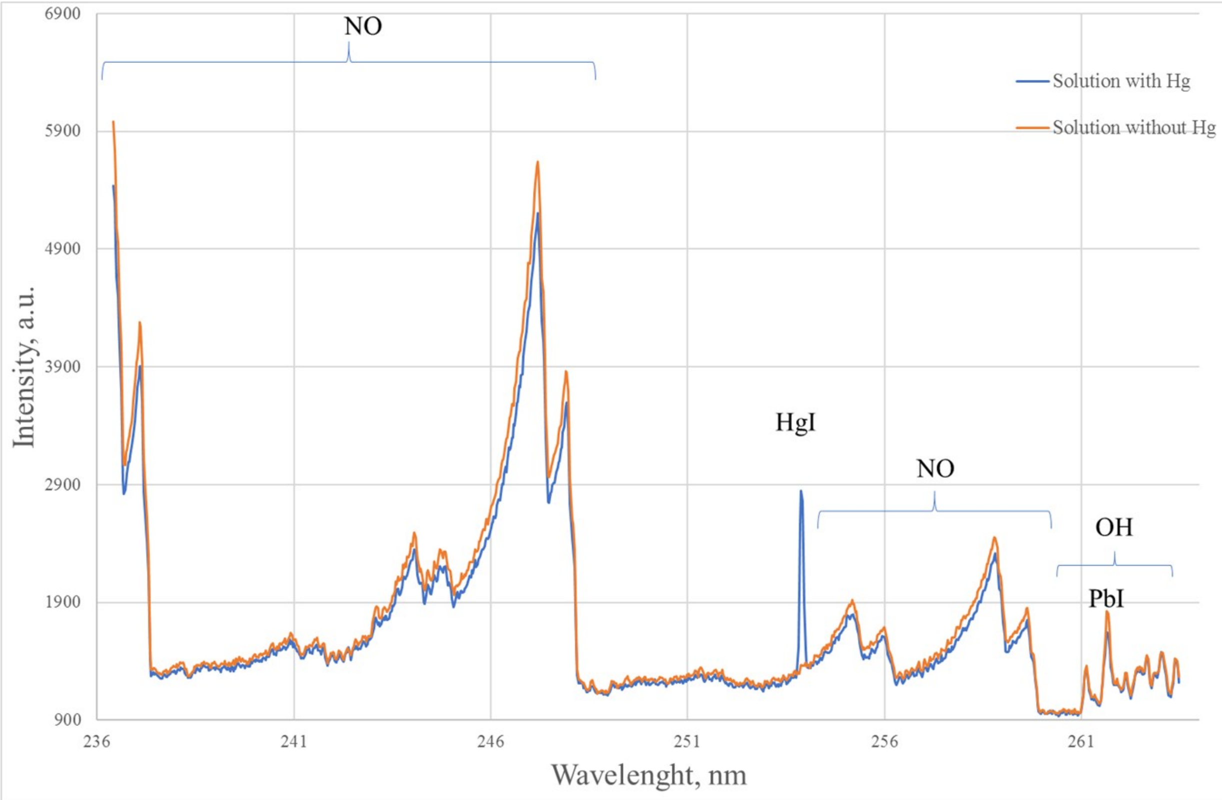

Fig. SI-1 Comparison of emission spectra of mch-LDA-APGD for solutions with and without Hg.

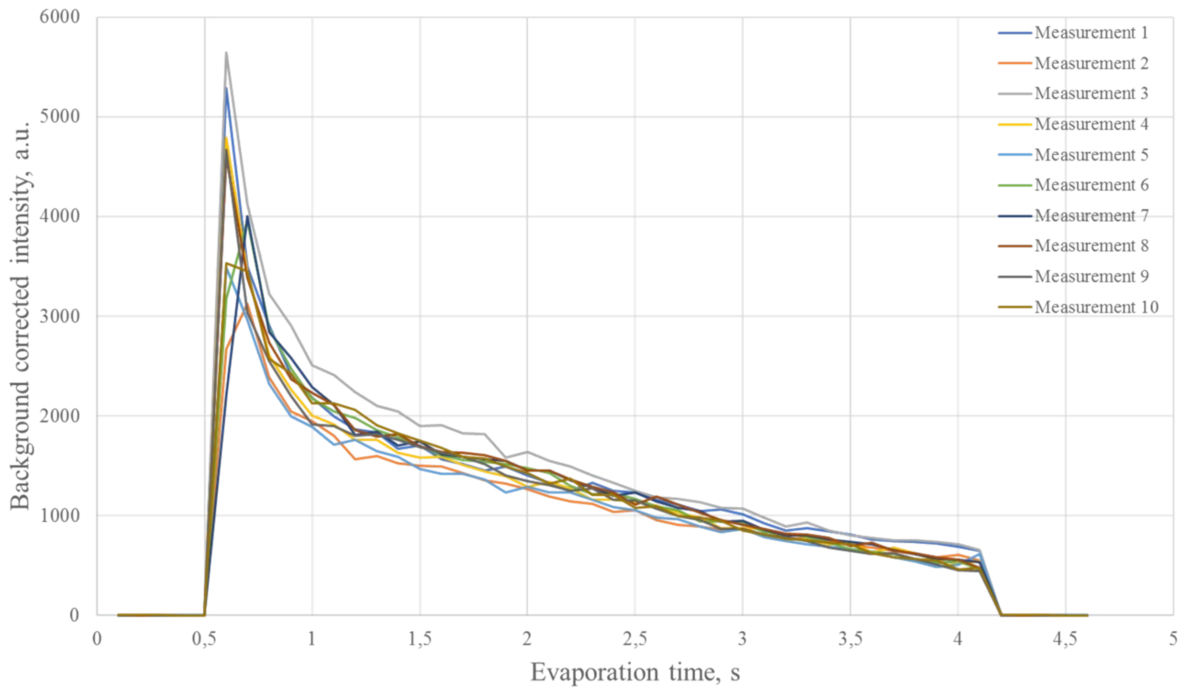

Fig. SI-2 The background corrected emission intensity profile of the Hg atomic emission line *versus* evaporation time of a solution drop.

Construction costs of the microchip: Production costs of one microchip are about 35 USD. Microchips presented in this work are fabricated using devices normally applied in production lines. LTCC technology does not require sophisticated conditions, e.g., clean rooms, laminar hoods, etc., to produce appropriate microchips. Because of this, it is easy to transform this technology into mass production. According to the datasheet for the DuPont 5742 paste, given sheet resistance is lower than 5 mΩ/sq for typical fired layer thicknesses of 6 to 12 μm. For thinnest layers, electrical resistivity is ~30 nΩ m, what corresponds to conductivity of 33 μS m^{-1}. The value is equal to ~73% of electrical conductivity of bulk Au with conductivity of 45 μS m^{-1}.

Temperature/electrical conductivity specification of the Au paste used as an electrode: Reference sheet resistance for the via filling DuPont 5738 paste is given to be lower than 5 mΩ/sq for a 25 μm thick layer. Hence, electrical conductivity is higher than 8 μS/m. The value is about 20% of this for bulk Au. Such low value is probably an effect of contents of some inorganic filler materials added to the paste for matching thermal expansion coefficient to the LTCC material. In case of thermal conductivity, even the value for planar metallization is similar to this for bulk Au. Low thickness of metallization (c.a. 10 μm) results in high total thermal resistance of the chip, because of relative low thermal conductivity of the LTCC ceramics (3.3 W m^{-1} K^{-1}). In case of the via paste, the expected value of thermal conductivity is lower than this for bulk metal because of ceramic filler presence in the paste (see M. A. Zampino, R. Kandukuri and W. K. Jones, High performance thermal vias in LTCC substrates, ITherm 2002. 8th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, San Diego, CA, USA, 2002, pp. 179-185). However, thermal conductivity of vias is much higher than the value for LTCC.