Determination of the level of defective beans in coffee samples by using array of nanostructured sensors

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Assessment of coffee quality is usually done by sensory evaluation (smell and flavor) of coffee cups performed by trained judges. Among different attributes the level of defective beans is one of the main concerns in the determination of coffee quality. The presence of defective beans (black, sour or brown, immature black, bored, broken, insect-damaged) are known to negatively influence coffee sensorial characteristics and decrease its price in the market [1]. Use of arrays of chemical sensors for taste and smell assessment of different foodstuffs has become more popular and different investigations have proven its straight correlation with taste panel evaluations [2]. In this work, the level of defective beans in coffee samples is determined by using an array of nanostructured chemical sensors. Seven coffee samples (coffee blends containing different levels of defective beans (0, 5, 10, 20, 30, 40, and 100% in wt%) were prepared from good and defective beans of strictly soft *Coffea Arabica* (2006 crop) selected by a same electronic sorter. For the measurements with the sensors coffee samples were prepared as coffee brew. The chemical sensors consisted of nanostructured films of sulfonated lignin and sulfonated polystyrene and conjugated polymers, PANI, PEDOT, POMA, PPy deposited via layer-by-layer assembly onto gold interdigitated microelectrodes. The electrical capacitance of 5 sensors was computed for samples discrimination using principal component analysis (PCA) as multivariate data analysis tool. Results indicated an increase on the capacitance of all sensors as the level of defective beans increases. The sensitivity, however, was different for each sensor. PCA plot showed that the array is capable to discriminate six of the seven coffee samples, with an error smaller than 10%. Discrimination performance was constant during one week of measurements.

Keywords: coffee, defective coffee beans, sensors arrays, nanostructured sensors, conjugated polymers

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