In this paper, we present a hybrid sensor for simultaneous vapor determination of relative humidity and toluene concentration. This sensor has been manufactured by two printing techniques: inkjet printing to define the electrodes and screen printing to deposit a sensitive composite. The structure is based on three meandered electrodes, acting the central one as common of both sensitive parts of the sensor. Half of this device is able to measure toluene concentration by changes in the resistance of a graphite-polystyrene mixture, whereas the other half determines the moisture content through variations in the electrical permittivity of the flexible substrate. The response to toluene shows a quadratic response with a linear coefficient of 0.3 mΩ [Tppm]−1 and a quadratic part of 5×10−8 Ω[Tppm]−2. With respect to the humidity determination, a sensitivity of 11 fF/%RH has been achieved at 100 kHz and 5.5 fF/%RH at 1 MHz. No dependence with toluene has been found in the capacitive element, being possible the simultaneous detection of both magnitudes. The same working principle would be applicable to sense other gas species by only changing the resistive composite.

Stichworte: screen printing, Capacitance, inkjet printing, meandered electrodes, resistance