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APPLICATION OF CHEMIRESISTIVE POLYMER FILMS IN AIR QUALITY CONTROL

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History of application conductive polymers or polymer composites in gas sensing is not long time ago. *Okazaki* in 1999 reported about determined polymer-carbon nanoparticle composite electrical resistance change in presence of VOC [1]. Since that time a lot of research has been done to investigate: *i*) VOC sensitivity of different compositions varying conductive fillers and polymers; *ii*) the sensing mechanism and experimentally prove it; *iii*) cross-sensitivity and selectivity. However, long term stability of polymer based gas sensors is an issue, which demands improvement.

Nowadays importance of air quality control is even increased, because people daily habits are changed and more time is spent indoors or urbanised territories. In todays perspective chemiresistive polymer films (CPF) as a tool for air quality control is highly attractive and I will explain why. Comparing to other sensing devices CPF are selective. It means that composite response to different VOC like toluene, benzene, ethyl acetate, acetone and etc. deviates [2-4]. *Zeng W.* even describes possibility to distinguish VOC by the molecule size [3]. Results obtained at lab show that CPF are sensitive enough - concentrations greatly below VOC regulated exposure limits can be sensed, for example, toluene 10-15 ppm was detected by composite made of thiophene based conducting polymer and carbon black nanoparticles [5]. CPF operate at room temperature, therefore low power air quality control devices can be made. Cost of CPF based sensing element is low and has potential to be easily mass-produced by printing [6].

Composite sensing mechanism of gases determines which gases could be detected by certain composition. Best results for non-conductive polymer composites are obtained when these composites are applied for VOC detection. Data available in literature evidence that conductive polymer nanocomposites, for example, polyaniline(PANI)-Ag nanocomposite, PANI-single wall carbon nanotubes composite or PANI-metal salt ($CuCl_2$) are more preferable for inorganic gas detection like SO_2, CO_2, H_2S and NH_3. Promising sensing results have been reported in literature for conductive polymer nanocomposites reaching 1 ppm detection limit of inorganic gases. According to OSHA data time weighted average (TWA) for SO_2 - 2 ppm, CO_2 - 5000 ppm, H_2S - 10 ppm and NH_3 - 50 ppm.

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