Conductometric Methanol Microsensor Based on Electrospun PVC-Nickel Phthalocyanine Composite Nanofiber Technology

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Abstract : Due to its application in different domains, such as fuel cell configuration and adulteration of alcoholic beverages, a miniaturized sensor for methanol detection is urgently required. A conductometric microsensor for measuring volatile organic compounds (VOC) was conceived, based on electrospun composite nanofibers of polyvinyl chloride (PVC) doped with nickel phthalocyanine(NiPc) deposited on interdigitated electrodes (IDEs) used transducers. The nanofiber's shape, structure, percent atomic content and thermal properties were studied using analytical techniques, including scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and thermogravimetric analysis (TGA), respectively. The methanol sensor showed good sensitivity (505µS/cm(v/v) $^{-1}$), low LOD (15 ppm), short response time (13 s), and short recovery time (15 s). The sensor was 4 times more sensitive to methanol than to ethanol and 19 times more sensitive to methanol than to acetone. Furthermore, the sensor response was unaffected by the interfering water vapor, making it more suitable for VOC sensing in the presence of humidity. The sensor was applied for conductometric detection of methanol in rubbing alcohol.

Keywords : composite, methanol, conductometric sensor, electrospun, nanofiber, nickel phthalocyanine, PVC
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