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LETTER

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Phthalonitrile Conductive Polymer Chemical Vapor Sensors

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An intrinsically stable, highly conductive polymeric chemical vapor sensor has been fabricated from an aromatic, diether-linked phthalonitrile resin. Preliminary chemical vapor studies show that this pyrolyzed semiconductive material responds reversibly and somewhat selectively to ammonia and acetone from among a number of vapors tested. Electrical resistance at room temperature is increased by a few percent within the first 10 to 30 seconds of exposure to these vapors in a dynamic equilibrium nitrogen carrier/vapor flow dilution system. A concentration-dependent electrical response study was carried out in which the polymer was exposed to a range of dilution concentrations of dry ammonia gas at room temperature. Sample voltage changes between 23 mV and 14 mV were measured over ammonia/nitrogen dilution concentrations from 10,000 ppm to approximately 45 ppm.

1. Introduction

Electrically conductive polymeric materials are finding wide use in the area of integrated solid-state electronics in which these materials are gradually replacing metals and inorganic semiconductors. The scope of applications include batteries, EMI shielding, biomedical membranes, ion-exchange devices, ionization detectors, chemical vapor sensors and indicators.[1]