CHAPTER II

LITERATURE SURVEY

Lenz *et al.* (1988) showed that poly(phenylene vinylene) can be synthesized as a high molecular weight polymer as a film from a precursor following the Wessling route. Two types of p-xylene bis-sulfonium chloride monomer were prepared from cycloalkylene sulfide and from the precursor by using the thermal elimination reaction. They were compared with those of two monomers prepared from dialkyl sulfides. They found the cyclo- alkylene sulfonium chloride monomer polymerized gave moderate yields (39% at 20 min) and a higher molecular weight polymer. For the electrical conductivity, they found that the polymer containing cyclic sulfonuim group gave much higher conductivities than those from the polymer containing dialkyl groups; the main factor was the order and the degree of orientation in polymer molecule.

Peres *et al.* (2006) prepared modified a PPV by substituting halogen on the aromatic ring. They discovered that the fully conjugated modified PPV structure had good electron transport properties. Both fluorescence peaks at 511 and 551 cm^{-1} of the unsubstituted PPV shift to one peak at longer wavelength (590 cm^{-1}) in the cases of chloro- or bromo- substituted PPV (Cl-PPV and Br-PPV). From this study, it indicates that the presence of the halo subtituent group can improve the electronic properties of the polymer. The reasons are the halogen group can decrease the fluorescence and an intrinsic doping of semiconductor polymer can be introduced by the electron withdrawing halogen group.

Ahlskog *et al* . (1997) developed conductive properties of poly(p-phenylene vinylene) by doping PPV with acid solution. Poly(p-phenylene vinylene) is a conjugated polymer well known for its electro-optical properties in the neutral or in the undoped state. Doped PPV with sulfuric acid (PPV-H_2SO_4) may be considered as one of the very best conducting polymer systems in terms of room temperature conductivity (10^4 S/cm), with a resistivity ratio of 1.1. In comparison with iron trichloride ($FeCl_3$) doped samples, they were observed to be less conducting (10^3 S/cm) and were insulators at low temperatures. Doping of PPV with CF_3SO_3H also resulted in a high conductivity as well.

Babudri *et al.* (2002) prepared a bridged dialkyl PPV film towards analyse gas with casting by arachidic acid The polymer sample was deposited as thin film by solvent casting on silicon substrates with gold electrode and was exposed to NO_2 oxidizing agent at working temperature of 75 °C. Unfortunately, multilayer containing arachidic acid did not show any sensitivity toward all analyse gases.

Prissanaroon *et al.* (2000) reported PPy films doped with DBSA used to detect small amounts of SO_2 in SO_2-N_2 mixtures. The short time conductivity response of the conductive films was improved by higher doping levels or by exposure to higher SO_2 concentrations. The gas sensitivity of a film of a given doping level, as measured by $\Delta\sigma_{dc}$, increased with SO_2 concentration. However, for a given SO_2 concentration, the gas sensitivity of the conductive films depended on doping level. Below a critical doping level, the gas sensitivity is independent of doping level. Above the critical doping level, the gas sensitivity rises sharply to a maximum and then slightly declined as the dopant concentration was increased. The results were interpreted in terms of the changes in the conductive film morphology from three-dimensional random coils to rod-like fibrillar structures. ·

Peres and Gruber (2006) prepared a doped block copolymer containing PPV as a gas sensor. The polymers were tested with vapors of several organic solvents. The advantages of these sensors are as follows: (1) no sensitivity to water; (2) good reproducibility; (3) fast response; (4) durability of at least six months; (5) cheap and easy to make; and (6) be able to use separately in single-sensor solvent detectors or in arrays for electronic noses.

Chuapradit *et al.* (2004) prepared poly(aniline)/zeolite composites toward CO. They found that increasing zeolite concentration decreased electrical conductivity and improved gas sensitivity.

Densakulprasert *et al.* (2005) found that poly(aniline)/zeolite composite can increase CO gas sensitivity by means of zeolite content, pore size of zeolite, and ion exchange. The increase of the zeolite content resulted in an increased gas sensitivity. The zeolite has a large pore size, it has ability to exchange cations whilst if the zeolite has a small pore size (such as Zeolites Y ans 13X), its ability is only to distribute cations.

Vilaseca *et al.* (2007) reported the coating of the SnO_2 sensor by the zeolite film in order to modify the response to a gas phase. The zeolite layer was grown on the outer SnO_2 surface. The zeolite-modified sensor were tested with various gases (e.g. H_2O, H_2, CO, CO_2, CH_4 and C_3H_8). The zeolite-modified sensor was able to response all single gases tested.

Rep *et al.* (2000) studied the adsorption of methanol over alkali metal exchange zeolites (ZSM, MOR, FAU) and investigated by IR spectroscopy. A lower Si/Al ratio can increase the interaction between methanol and hydrogen. This interaction was strengthened as the molecular weight of alkali metal cation increased. The interaction did not lead to higher temperature but the most important interaction occurred between the lone pair electron (electron donor) of methanol and the electron acceptor of zeolite.

Densakulprasert *et al.* (2005) investigated the effect of zeolite content, pore size, and ion exchange capacity on electrical conductivity response to carbon monoxide (CO) of polyaniline/zeolite composites. Zeolite Y, 13X and synthesized AlMCM 41, all having common cation Cu^{2+}, were dry mixed with synthesized maleic acid doped polyaniline, and were together compressed to form polyaniline/zeolite composites. The Y, 13X and AlMCM 41 zeolites had the nominal pore sizes of 7, 13 and 36 °A, and the Cu^{2+} capacities of 0.161, 0.087 and 0.044 mol/g, respectively. The order of sensitivity in term of electrical conductivity is zeolite 13X > zeolite Y > zeolite AlMCM41. Poor sensitivity of zeolite AlMCM 41 was due to its very large pore size and its lowest Cu^{2+} capacity. Zeolites Y and 13X had comparable pore sizes but the latter had a greater free volume and more favorable location distribution of Cu^{2+} ions within the pore. The temporal response time increased with the amount of zeolite in the composites but inversely related to the amount of ion exchange capacity.

Hagen *et al.* (2006) prepared zeolite doped on the platinum electrode covered with gold along with a chromium oxide layer between zeolite and gold. The result showed an outstanding sensor response. The layer was caused by the diffusion of the chromium bonding agent through the gold electrode during annealing of the zeolite layer, and the addition of Cr_2O_3 on the top of the electrode to form a new layer seemed to be responsible for the sensor effect.