Tuning of Work Function of Polyaniline Films for HCN Gas Sensors

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GasFET (Gas sensitive Field Effect Transistor) is a device that measures work function (WF) changes of the gate conductor when exposed to an analyte[1]. The WF changes are monitored by measuring the change in turn-on voltage (threshold voltage) of the device. One of the unique aspects of the GasFET is that the response (or sensitivity) of the device is controlled by charge–transfer interactions between the analyte and the gate material[1]. Because of that, the tuning of the initial WF of the gate conductor is very important. In our approach we use polyaniline films that are cast from formic acid, electrochemically deposited and/or modified.

The PANI films were exchanged electrochemically for different carboxylic acids[2] (Fig.1) after the deposition in the presence of mercuric chloride that forms HCN sensitive binding sites[3]. To investigate the effect of the different carboxylic acids, we used FT-IR peaks[2] and turn-on voltage of the GasFETs. The cathodic peak around 0V (shown by '*' in Fig. 1) was correlated with the quinoid to benzenoid peaks ratio from FT-IR (Fig. 2), and turn-on voltage (Fig. 3). Gas exposure experiments to HCN were conducted and the responses were correlated with the initial WF of the films obtained by turn-on voltage. Currently, optimization of the films is in progress, in order to improve the sensor performance.

Acknowledgement

This project is supported by the National Science Foundation, Grant No. CHE-9816017

References

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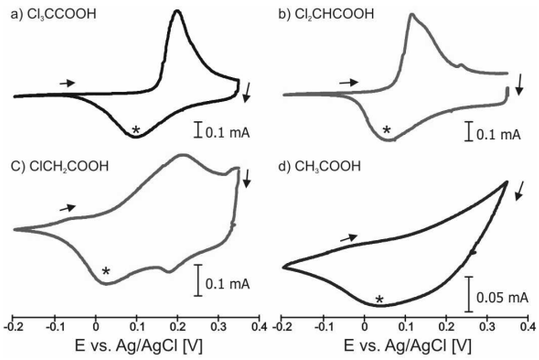

Fig. 1 Acid exchange of PANI films for carboxylic acids.

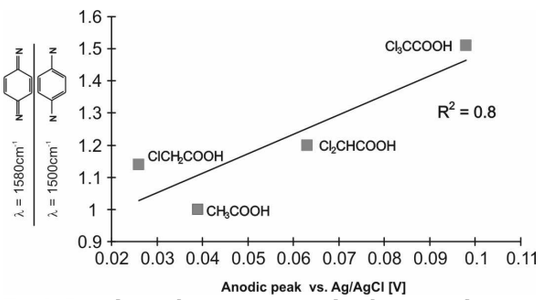

Fig.2 Correlation between quinoid to benzenoid ration and cathodic peak obtained din Fig. 1.

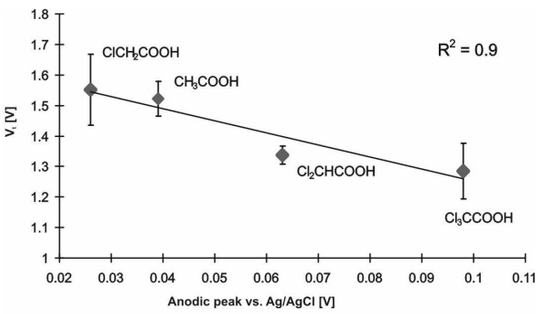

Fig.3 Correlation between turn-on voltage and cathodic peak obtained din Fig. 1.