Data Driven Modeling based on OES Sensor for Abnormal Vth Monitoring in the OLED Display Process - Jeong Jin Hong

Hyemin Lee/Sujin Park/Jongmyong Choi/Won-hyouk Jang
jj.hong@samsung.com -
hyemin51.lee@samsung.com/sujin47.park@samsung.com/jm7331.choi@samsung.com/damian.jang@samsung.com
Samsung Display Co., Ltd.
#95 Samsung 2-ro, Giheung-gu, Yongin-City, Gyeonggi-Do, 446-711, Korea
Phone: +82 -31-8000-7029 Fax: +82-31-8000-7029

Plasma Enhanced Chemical Vapor Deposition (PECVD) process for a-Si deposition is one cause of Vth fault so that data collected from the PECVD process is used to build a fault detection model to detect abnormal Vth caused by the a-Si deposition process. Compared with the conventional statistical process control (SPC) monitoring method, principal component analysis (PCA) model normally demonstrates better ability in fault detection and diagnosis by producing T2, SPE monitoring charts and contribution plot. However it has a drawback that it is unable to find out variables truly contributed to the detected abnormal behavior due to noise of data or nature of the given data. Iterative PCA modeling is introduced to overcome this limitation. This proposed modeling method enables to remove variables showing little contributions to the abnormal Vth values iteratively so that the key variables having true relations with the abnormality can be identified. In this paper, Optical Emission Spectroscopy (OES) data collected from the a-Si deposition process step is used to build a PCA model to detect glasses having abnormal Vth values. In addition, the proposed iterative PCA modeling is applied to identify key variables highly related with the PECVD caused Vth faults. The iterative PCA modeling shows a novel ability of identifying true variables related with the fault as it can find out 4 highly contributed variables to the Vth faults from 36 variables. Furthermore, it shows relationship between the detected Vth faults and S-factor changes which may offer useful information to understand impact of the deposited a-Si layer quality on the TFT device performance.

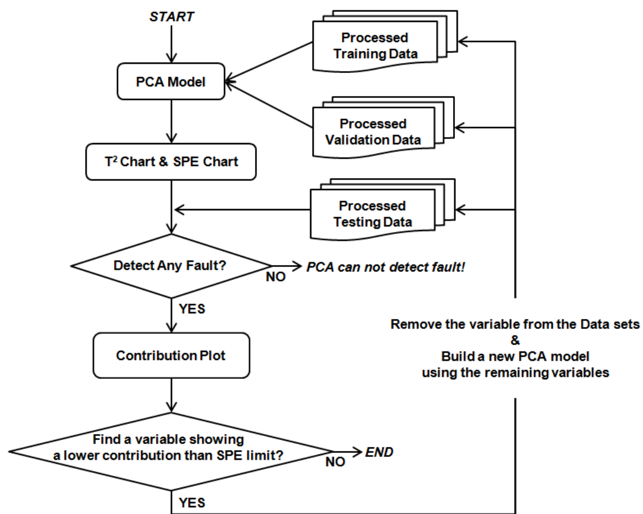

Figure 1. Flow diagram of iterative PCA modeling

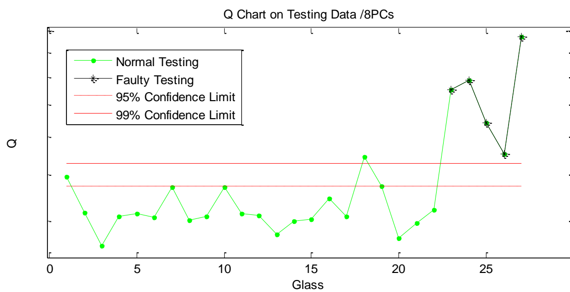

Figure 2. Monitoring result using Q chart on testing data

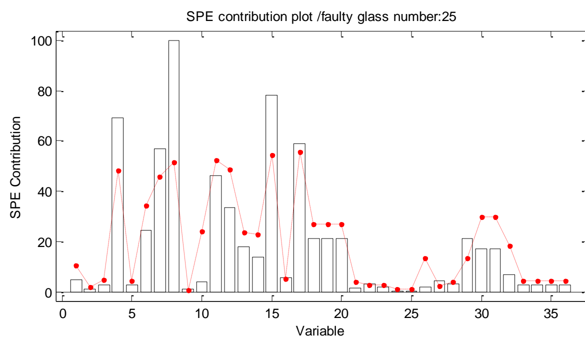

Figure 3. Contribution plot of one fault glass detected by Q chart

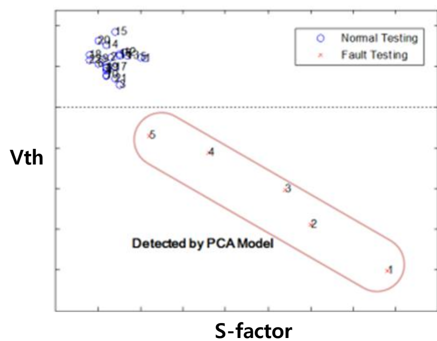

Figure 4. Comparison of S-factor and Vth