SENSING STRATEGY TOWARDS COKING IN NATURAL GAS PROCESSING THROUGH GCM TECHNOLOGY

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Abstract - Coke formation is a major problem with several petrochemical industries, which utilize natural gas (NG) and oil.Carbon deposition leads to massive energy loss by impeding heat transfer and by causingdeactivation ofchemical process, particularly, when depositsare formedon catalyst's surface. In situ monitoring and detection of coke formation at early stages will help in understanding the behavior of coke during NG reforming reactions, which will in turn, assist in early treatment and mitigation of such a deposition. In the present study, we utilizedgallium ortho phosphate crystal microbalance (GCM) sensors along with adequate setup and circuitry to monitor coke deposition during a NG chemical process. Initial results show that the sensor is capable of detecting infinitesimal small amount of carbon depositions during a partial methane oxidation reaction carried out at around 500 °C. The detection limit of the GCM is within a micro-gram resolution, as the proposed system was able to sense a 12 micro-gram of coke deposition after two hours of the reaction, according to Surbery equation. Towards proving that the sensor was affected by carbon deposition only, a following oxidation experiment was carried out and produced CO_2, confirming the carbon existence.Major improvements to GCM sensors are required to apply for higher temperature (e.g. about 800°C) measurements.

Keywords - Coke, GCM,Methane, Reforming, Sensor