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Electrodeposited chlorine doped cuprous oxide thin films for gas sensing applications

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Metal oxide semiconductor based gas sensors are widely used to detect gases mostly at high temperatures. This study was conducted to investigate the gas sensing properties of chlorine doped cuprous oxide thin films for Liquefied Petroleum (LP) gas. Chlorine doped Cu_2O films were prepared by the electrodeposition method. The electrodeposition was accomplished in a three electrode electrochemical cell containing aqueous solutions of a mixture of lactic acid (3 M), cupric sulphate (0.45 M) and sodium hydroxide and was characterized using Photocurrent Spectral response. Resistances of chlorine doped Cu_2O thin films for LP gas were measured while exposing the film samples to the gas in a chamber using two spring probe contacts. The resistance values of undoped samples varied in the MΩ range. Chlorine doped samples had lower resistances that varied in the kΩ range. In contrast to the earlier reported sensing properties of electrochemically deposited n-type cuprous oxide (Cu_2O) thin films, chlorine doped Cu_2O thin films showed a remarkably different response to the LP gas sent under the same flow rates, showing two temperature dependent sensitivity peaks that existed at relatively low temperatures. This will make chlorine doped Cu_2O thin films practically useful for sensing LP gas.

Keywords: electrochemical, gas sensing, LP gas, resistance, thin films, chlorine doped

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