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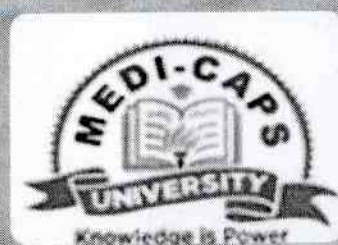
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# Metal Metalloid Thin Film For The Application of Field Effect Transistor

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**Abstract**—Metal Selenium thin film prepared as Metal Semiconductor Field Effect Thin film Transistor. Metal (Al/Cu) contact and metalloid (Se) channel used as a Field Effect Transistor on glass substrate by depositing the source, drain and top-gate Al/Cu contact. Metal gate is used to control flow of charge from source to drain. By varying the width of depletion layer channel has controlled using metal contact which modulates the thickness of conducting channel which causes flow of current between source and drain. The source and drain of the FET structure were defined by the metal layers Cu were sequentially deposited on the Se in the defined contact patterns by thermal evaporation technique at pressure of  $10^{-5}$  torr using vacuum coating unit. Its electrical and structural properties were characterized. This device is used to control the flow of current by changeable potential applied between gate and source ( $V_{GS}$ ), and free charge accumulation has induced at semiconductor interface.

**Keywords**—Metal Semiconductor Field Effect, Thermal evaporation, schottky metal gate Introduction

## I INTRODUCTION

III-VI group semiconductors made heterostructures promising Optoelectronic properties due to their close lattice matching [1,20] are studied for their structural, optical and electrical properties [3,16]. thin-film transistor (TFT) is a field-effect transistor which has made by thin films deposition of semiconductor and dielectric layers using metallic contacts [2,13]. Glass is used as a common substrate, due to its prime application in displays [3]. The leakage current as a result of thermionic field emission between gate and the channel limits the performance of these devices [4]. Selenium is a metalloid it has some characteristics of metal & some characteristics of non metal so it is also called as semiconductor. dissimilar metal-semiconductor-metal ratios results by evaporation of after heating in a vacuum chamber, resting on the confidence of size of crystallite, orientation preferential, unevenness, have been studied, In metal semiconductor interface gate made by metal forms a schottky barrier will be formed [5,21]. The free electrons are able to cross the depletion region with effect of energy source from one side to other. Source and drain are directly connected to semiconductor, determine transistor dimensions. Aluminum is used as contact material in IC's exhibits good corrosion resistance. As voltage which has applied to gate

electrode bulk charge is involved with electric field applied which structure conducting channel. Glass plate is used as a substrate on which active layer is grown to make it partially insulating substrate. The higher transit frequency of the FET has common application in microwave circuits [6].

## II. EXPERIMENTAL

The samples had equipped by thermal evaporation at a pressure of  $10^{-5}$  torr. High purity of Aluminium sheet and Copper about 99×999% pure, and selenium Powder purchased from Koch-Light laboratories LTD, colnbrook Berks England [7, 18]. The properly cleaned glass substrate of 1x1 cm<sup>2</sup> dimension, substrate cleaning is done using soap solution and keeps it in hot chromic acid and then cleaning done by deionized water then rinse in acetone, were placed in the holder situated above the tungsten boat which carrying materials. After reaching the high vacuum ( $10^{-5}$  torr) in the chamber the metal and Se heated by transient the current slowly to the electrodes [5,6]. Selenium having thicknesses 1000 Å was first evaporated and later metal of constant thickness (500 Å) deposited over these films to get metal-Se bilayer structure. Thickness of the material on substrate was controlled using quartz crystal monitor ("Hind Hivac" Digital Thickness Monitor Model-DTM-101) [19, 22]. Metal having thicknesses 500 Å were again evaporated at high pressure and deposited on bilayer structure to form a Trilayer metal gate contact for thin film structure. The total thickness of the Metal-Se-Metal thin film is about 200 nm and the thickness of a single layer is 50 nm/100 nm/50 nm.

## III RESULTS AND DISCUSSION

### A. Electrical properties

We observed that the fabricated FET is gives the increase of the drain current at negative gate voltages of a MESFET (between 0 V to -10 V) and which has compared to quadratic expression

$$I_{D,sat} = \mu_n \frac{q N_A}{w L} \frac{(V_G - V_T)^2}{2}$$

Where w is the width of depletion layer in channel layer [7]. The quadratic expression given as

$$V_G = 0_1 \text{ for } w = 3d/8$$