# Study of ITO/p-SiGe Contact System

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**ABSTRACT**

Indium-Tin-Oxide (ITO) has been deposited onto undoped Si0.8Ge0.2 layer by using radio frequency (RF) sputtering system, where the Si0.8Ge0.2 layer was grown onto n-Si substrate by using ultra-high vacuum chemical vapor deposition (UHV CVD). The undoped Si0.8Ge0.2 layer, with a thickness of 150 nm, is a strain layer and p-type. The optimum sputtering conditions are sputtering power of 30 W, Ar flow rate of 110 sccm, pressure of 10 mtorr at room temperature. Under these conditions, the ITO film has a sheet resistance of 32.5Ω/□ and reduced to 28.7Ω/□ by post-annealed at 600°C, where the transmittance of ITO films are more than 80% for all interested wavelength. ITO/p-Si0.8Ge0.2 contact systems with Si capping layer (10 nm), i.e, ITO/Si/p-Si0.8Ge0.2, and without Si capping, i.e, ITO/p-Si0.8Ge0.2, have been prepared for our study. The specific contact resistance measured by transfer length model (TLM) are 2.78x10-2 Ω-cm2 (600oC annealed) and 2.26x10-5Ω-cm2 (without annealed) for ITO/Si/p-Si0.8Ge0.2 and ITO/p-Si0.8Ge0.2 structures, respectively. Finally, the metal-semiconductor-metal (MSM) photodetectors using ITO electrodes have been fabricated with and without Si capping. With 500μW halogen lamp irradiation, the ITO/p-SiGe has a peak response at a wavelength of 1129nm and its responsivity is 0.58A/W under 1V bias. However, dual wavelength responses are observed for ITO/Si/p-SiGe structure under 1 V applied bias and is attributed to the absorption of Si and Si0.8Ge0.2 layers. The 1 V bias would deplete Si capping and SiGe layers because Si (10 nm) and SiGe (150 nm) layers are very thin as a result of Schottky contact of ITO/p-Si. The responsivity are 0.639A/W and 1.105A/W for wavelength at 957nm and 1150nm. Higher responsivity at 1150 nm is due to thicker film of SiGe layer than the thickness of Si capping.

Keywords : RF sputtering system、Indium-Tin-Oxide、SiGe、annealing、responsivity.

**Table of Contents**

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