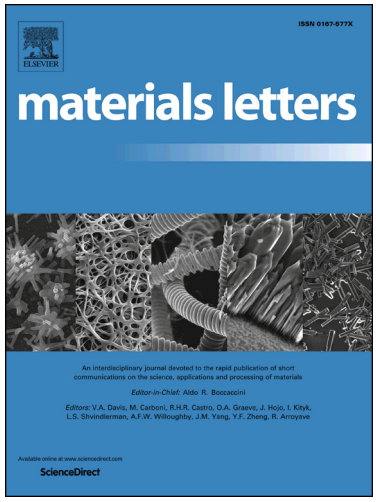

Air ambient and composition effects of molybdenum oxides on photovoltaic and physical characteristics of screen-printed mono-crystalline silicon solar cells

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Air ambient and composition effects of molybdenum oxides on photovoltaic and physical characteristics of screen-printed mono-crystalline silicon solar cells

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Air ambient and composition effects of molybdenum oxides on photovoltaic and physical characteristics of screen-printed mono-crystalline silicon solar cells (SPMSCs) were presented. The conversion efficiency (CE) was found to increase when the specimen of MoO_2 was exposed to vacuum before the silver evaporation. Compared with screen-printed (SP) Al contact, a CE improvement of more than 1.1% absolute from 17.2% to 18.3% in SPMSCs with $MoO_{2.2}$/Ag stacked film as rear hole-selective layer (HSL) was demonstrated. To enhance the reliability of MoO_x/Ag HSL, a low-temperature SP silver paste was proposed.

Keywords: Solar energy materials, Electronic materials, Molybdenum oxides, Screen-printed, Silicon solar cells

1. Introduction

SPMSCs have been universally adopted for photovoltaic industrial solar cells [1-3]. In general, SP Al pastes were utilized to SPMSCs for formation of rear contacts [4]. However, literatures reported that the rear surface recombination velocities ranging from 130 to 450 cm/s were provided by Al back-surface-field [5-6]. Thus, the improvements in the properties of rear contact are highly desirable. Recently, transition metal oxides (TMO) such as MoO_3, V_2O_5 or WO_3 have been extensively application as HSLs in silicon-based solar cells [7-9]. A silicon solar cell with a power CE of 14.3% was demonstrated using a MoO_x layer of 15 nm as a HSL to n-type silicon [10]. Parasitic light absorption losses in the doped amorphous silicon films of silicon heterojunction solar cells can be mitigated by wide-bandgap TMOs [11]. Enhanced mechanism for generating a change in electrical conductivity of MoO_x films was presented by the presence of states within the band gap due to the lack of oxygen [12]. Thus, in this letter, the effects of air ambient and composition in MoO_x on photovoltaic characterizations of SPMSCs were investigated. A low-temperature SP silver paste was proposed to enhance the reliability of SPMSCs.

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