Abstract

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Project Title: Study and development of electron devices with an emphasis on nanoelectronics and atmospheric hybrid cold plasma technologies

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Herein, we employed atmospheric hybrid cold plasma (HCP) to elucidate how NAP fundamentally interacts with seed surfaces. We show that nonthermal atmospheric plasma can control water imbibition (WI) and liquid spreading on seeds. By investigating two distinct seed surface structures and their permeabilities, we show that the modified-surface properties are primarily due to the combined effects of enhanced physical etching and chemical functionalization. We propose the tunable surface functionalization model based on electric field assisted electron-ions initiated impact ionization enhancing the reactive species (RS) generation. Well-control wettability and related attributes opens up new avenues for the nonthermal atmospheric plasma treatment of a broad range of surfaces. Moreover, Future nanoelectronics will require a high packing density of semiconductor devices so that electrons can be transported at speeds approaching their ultimate we employ high voltage pulses to create a nanoscale defect-void channel in an oxide to conduct an out-of-plane electron current from 2-D electron gas in a p-Si substrate to a metal electrode of metal–oxide–semiconductor structure. With this approach, we exploit the advantage of changes in the SiO_2/Si structure after oxide breakdown and carrier transport properties to increase device performance. The electrical characteristics of the two-terminal device indicate ballistic electron transport in the nanochannel, providing potential energy efficient and high-speed (in the picosecond regime) applications for computing systems and logic circuits with low-cost fabrication.

Keywords: Ballistic transport, dielectric, electron emission, nanoscale interface engineering, surface functionalization, non-thermal atmospheric plasma,