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Reactive plasma processes for formation of high-mobility IGZO thin film transistors

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Reactive plasma process systems are developed via installation of inductively-coupled plasmas (ICP) sustained with low-inductance antenna (LIA) for low-temperature fabrication of flexible electronics, which require large area and low damage processes with reactivity control capabilities at low substrate temperature. Major advantage of the reactive processing system is that the reactivity during film-deposition processes are often enhanced and controlled via low-damage and high-density plasma production for low-temperature processing of devices. The reactive plasma processes have been applied to sputtering deposition of transparent amorphous oxide semiconductor a-InGaZnOx (a-IGZO), which has attracted great attentions as key material for next-generation flexible electronics. thus far post annealing at elevated temperature (as high as 400°C) was required. Thus the traditional process for fabrication of the IGZO TFTs has been carried out on glass substrates. With the advanced reactivity controlled plasma processes during this study, a-IGZO thin-film transistors (TFTs) with mobility as high as or above 40 cm2/Vs was successfully formed at substrate temperature less than 200°C. during this presentation, the reactive plasma processes are presented for low-temperature formation of IGZOTFTs.

As an emerging branch of energy conversion technologies, triboelectric nanogenerator (TENG) invented in 2012 exposes a fresh path for effectively harnessing sorts of mechanical energies, which are ubiquitous and abundant but usually wasted in our ambient environment. So far, the TENG has experienced a rapid and booming development period, starting from architecture design, materials selection, and modification to performance optimization, power management, and application exploration.[14-25] By coupling two common phenomena of contact-electrification effect and electrostatic induction, four sorts of working modes are gradually evolved and proposed for TENGs, as shown in all together cases, oppositely polarized triboelectric charges are often generated on material's surfaces during the contact-electrification process then the electrostatic induction renders a drive for transformation of mechanical stimuli into electric energy when relative motion occurs. supported fundamental physical model of Maxwell's displacement current, the TENGs are often essentially considered a sort of capacitive variable electric-field source, and their output power is proportional to the square of triboelectric charge density.[26,27] that's to mention , the key to enhance TENGs' performance is trying to substantially increase the quantity of generated triboelectric charges. in theory , the greater the difference of electron affinity between two triboelectric materials is, the more the triboelectric charges are often generated.[17,25] provides a triboelectric series for varied materials ranked consistent with their capabilities of gaining or losing electrons against friction, which may guide researchers to get high output performance for TENGs from the triboelectric material selection point of view.[28-32] Note that the bulk of materials within the list belong to PMs, which possess all kinds of functional groups, like fluorine (□F), cyano radical (□CN), ester group (□COOR), acyl (□CON□), carboxyl (□COOH), and nitro (□NO2) as electron-withdrawing groups, and amidogen (□NH2), amide group (□CONH), oxhydryl (□OH), and alkoxy (□OR) as electron-donating groups. All of those functional groups can play a serious

Note: This work is partly presented at 21st International Conference on Advanced Energy Materials and Research

role responsible transfer and charge capturing during contact-electrification process by right of their unique hybrid orbital configurations. Moreover, featuring other merits of superior flexibility, machinability, stretchability, scalability, and low weight, PMs have thus inevitably become the core foundation of the TENGs technology.

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