TW-P060

## Characteristics of photo-thermal reduced Cu film using photographic flash light

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Various materials including conductive, dielectric, and semi-conductive materials, constitute suitable candidates for printed electronics. Metal nanoparticles (e.g. Ag, Cu, Ni, Au) are typically used in conductive ink. However, easily oxidized metals, such as Cu, must be processed at low temperatures and as such, photonic sintering has gained significant attention as a new low-temperature processing method. This method is based on the principle of selective heating of a strongly absorbent film, without light-source-induced damage to the transparent substrate. However, Cu nanoparticles used in inks are susceptible to the growth of a native copper-oxide layer on their surface. Copper-oxide-nanoparticle ink subjected to a reduction mechanism has therefore been introduced in an attempt to achieve long-term stability and reliability.

In this work, a flash-light sintering process was used for the reduction of an inkjet-printed Cu(II)O thin film to a Cu film. Using a photographic lighting instrument, the intensity of the light (or intense pulse light) was controlled by the charged power (Ws). The resulting changes in the structure, as well as the optical and electrical properties of the light-irradiated Cu(II)O films, were investigated. A Cu thin film was obtained from Cu(II)O via photo-thermal reduction at 2500 Ws. More importantly, at one shot of 3000 Ws, a low sheet resistance value (0.2527 Ω /sq.) and a high resistivity (~5.05−6.32 × 10-8 Ω m), which was ~3.0−3.8 times that of bulk Cu was achieved for the ~200−250-nm-thick film.

**Keywords:** photographic flash light, photo-thermal reduction, Cu(II)O nanoparticle, inkjet printing, Low temperature process

TW-P067

## Electrical Characteristics of Solution Processed In-Ga-ZnO Thin Film Transistors (IGZO TFTs) with Various Ratio of Materials

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The In this paper, we have fabricated the solution processed In-Ga-ZnO thin film transistors (IGZO TFTs) by varying indium and gallium ratio. The indium ratio of IGZO TFTs was changed from 1 to 5 at fixed gallium and zinc oxide atomic percent of 1:1 and gallium ratio was varied from 1 to 5 at fixed indium and zinc oxide atomic percent of 1:1.

When the indium ratio was increased at fixed gallium and zinc oxide ratio of 1:1, threshold voltage was negatively shifted from 1.03 to -6.18 V and also mobility was increased from 0.018 to 0.076cm2/V•sec. It means that the number of carriers in IGZO TFTs were increased due to great formation of the oxygen vacancies which generate electrons.

In contrast, when the gallium ratio was increased in IGZO TFTs with indium and zinc oxide ration of 1:1, the on/off current ratio was increased from 1.88X104 to 2.22X105. It is because gallium have stronger chemical bonds with oxygen than that with the zinc and indium ions that lead to the decreased in electron concentration.

**Keywords:** IGZO TFTs, Solution process, Indium, Gallium, Ratio