Supporting information

Solution processed Li$_5$AlO$_4$ dielectric for low voltage transistor fabrication and its application for metal oxide/quantum dot heterojunction phototransistor

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Fig. 1S. Grazing incidence X-ray diffraction (GIXRD) analysis of Li$_5$AlO$_4$ dielectric thin film
Fig. 2S. FTIR analysis of Li$_5$AlO$_4$ dielectric thin film anneal at 350 °C, 500 °C and 700 °C

Fig. 3S: Cross-sectional scanning electron microgram of p++-Si/ α-Li$_5$AlO$_4$/ IZO film
Fig. 4S The output characteristics for TFT fabricated with a) β-Li$_5$AlO$_4$ c) a- Li$_5$AlO$_4$ dielectric. Transfer characteristics for TFT fabricated with b) β-Li$_5$AlO$_4$ d) a- Li$_5$AlO$_4$ dielectric.
Table 1S: Comparison with recently published other high – k dielectric TFT

<table>
<thead>
<tr>
<th>Dielectric Materials</th>
<th>Semicon-ductor</th>
<th>Fabrication Route</th>
<th>Capacitance (C) nFcm⁻²</th>
<th>Mobility (μ) cm²V⁻¹Sec⁻¹</th>
<th>Product of capacitance and mobility (μ.C) nF V⁻¹Sec⁻¹</th>
<th>Novelty</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-Li₅AlO₄</td>
<td>IZO</td>
<td>Solution - Processed</td>
<td>332</td>
<td>21.4</td>
<td>7304</td>
<td>New TFT gate dielectric. High capacitance and mobility (μ.C) which result high current density TFT</td>
<td>This work</td>
</tr>
<tr>
<td>HfLaOₓ</td>
<td>ZnO</td>
<td>Solution - Processed</td>
<td>190.09</td>
<td>1.6</td>
<td>330.15</td>
<td>Solution processed TFT gate dielectric</td>
<td>1</td>
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<tr>
<td>LiOₓ</td>
<td>InₓOₙ</td>
<td>Solution - Processed</td>
<td>465</td>
<td>5.7</td>
<td>2650</td>
<td>New sol-gel derived TFT gate dielectric</td>
<td>2</td>
</tr>
<tr>
<td>Strontium titanate</td>
<td>Pentacene, CuPc</td>
<td>RF magnetron sputtering</td>
<td>41</td>
<td>2.0</td>
<td>2.46</td>
<td>Flexible device</td>
<td>3</td>
</tr>
<tr>
<td>Strontium oxide (SrOₜ)</td>
<td>InₓOₙ</td>
<td>Solution - Processed</td>
<td>350</td>
<td>5.6</td>
<td>1963</td>
<td>Solution processed TFT gate dielectric</td>
<td>4</td>
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<tr>
<td>Magnesium titaniumoxide (Mgₓₜₜₜₜ)</td>
<td>IZO</td>
<td>Solution - Processed</td>
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<td>3.4</td>
<td>170</td>
<td>New sol-gel derived TFT gate dielectric</td>
<td>5</td>
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</table>

Fig. 5S Stability test of a α-Li₅AlO₄ dielectric TFT a) bias stress stability b) ambient atmosphere storage stability
Fig. 6S Depletion layer formation of p-PbS/n-IZO heterojunction and photogenerated e-h separation due to the effect of barrier potential.

References: