Use of Laminar Air Flow Bench

1. Spin Coater
2. Hot Plate
3. Sonicator

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Solution Synthesis

A. Indium Gallium Zinc Oxide (InGaZnO)

→ The 0.1 M DLPIGZO solution synthesized by dissolving 225.6mg of Indium Nitrate Hydrate ($In(NO_3)_3$. xH2O), 21.3 mg of Gallium Nitrate Hydrate ($Ga(NO_3)_3$. xH2O), and 31.5 mg of Zinc Nitrate Hydrate ($Zn(NO_3)_2$. xH2O,) in 10 mL of 2-methoxyethanol.

→ 20-200 µL of Acetylacetone (aq) and 770 µL of Ammonium hydroxide (aq) (NH_4OH, 28.0% NH_3 in water) were added in IGZO solutions.

→ The total mole ratio 9:1:2 of In, Ga, and Zn. After being stirred vigorously for 24 h at room temperature, the solutions appeared as light yellow transparent and homogeneous.

→ All solutions filtered through a 0.2 µm PTFE syringe filter.

Solution Synthesis..

B. Solution synthesis of Al2O3 and ITO solutions

→ The 0.2 M Al_2O3 solution was synthesized by dissolving 750 mg of Aluminum Nitrate Nonahydrate ($Al(NO_3)_3 \cdot 9H2O$), in 10 mL of 2-methoxyethanol

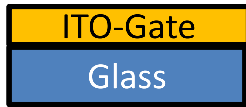
→ The 0.5 M ITO solution was synthesized by dissolving 1.35 g of Indium Nitrate Hydrate ($In(NO_3)_3 \cdot xH2O$), and 94.8 mg of Tin Chloride (SnCl2), in 10 mL of 2-methoxyethanol . Total mole ratio of ITO was 9:1 of In and Sn.

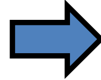
→ 100 µL of Acetylacetone (aq) and 35 µL of Ammonium Hydroxide (aq) (NH_4OH, 28.0% NH_3 in water), were added in solutions.

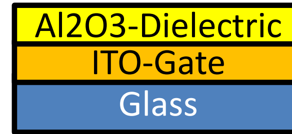
→ After stirring vigorously for 24 hrs at room temperature, the solutions appeared light yellow, transparent and homogeneous.

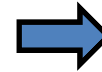
→ All solutions were filtered through a 0.2 µm PTFE syringe filter

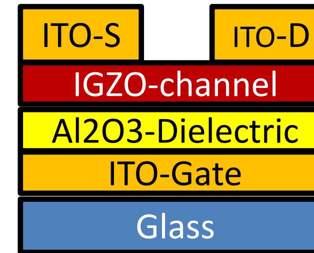
Thin Film Transistor structure to be fabricated











1. Glass substrate

2. ITO Gate contact

→ Spin Coating
1500 rpm -30sec
→ Prebaking (in air)
100^0C – 1min
→DUV exposure (10min in air) (184.9nm (10%) and 253.7nm(90%) with hard contacting shadow or quartz mask
→ Sample development
20ml Methanol (CH_4O)+ 1 ml acetic acid (CH_3COOH) 5 sec at room temperature and then clean with DI water
→ Annealing 350^0C 3 hrs in inert ambient

3. Al2O3 dielectric

→ Spin Coating
3000 rpm -30sec
→ Prebaking (in air)
100^0C – 1min
→DUV exposure (10min in air) (184.9nm (10%) and 253.7nm(90%) with hard contacting shadow or quartz mask
→ Sample development
20ml Methanol (CH_4O)+ 1 ml acetic acid (CH_3COOH) 5 sec at room temperature and then clean with DI water
→ Annealing 350^0C 3 hrs in inert ambient

4. IGZO semiconductor

→ Spin Coating
3000 rpm -30sec
→ Prebaking (in air)
100^0C – 1min
→DUV exposure (10min in air) (184.9nm (10%) and 253.7nm(90%) with hard contacting shadow or quartz mask
→ Sample development
20ml Methanol (CH_4O)+ 1 ml acetic acid (CH_3COOH) 5 sec at room temperature and then clean with DI water
→ Annealing 350^0C 3 hrs in inert ambient

5. ITO source /Drain—as 2