

Template for Preparation of Extended Abstract for IWRESD-2021 Proceedings

{Title 14 point, Times New Roman, Bold and Center}

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Abstract—Pentacene based organic thin film transistor (OTFT) is viable low cost alternative to amorphous silicon based thin film transistor. That's why extensive research is going on this field worldwide. Here, we have studied the transistor characteristics of pentacene based OTFT such as mobility, threshold voltage as a function of pentacene deposition rate.

Index Terms— OTFT, mobility and threshold voltage.

I. INTRODUCTION

In recent years, organic thin film transistor based on either polymer or small molecules have shown a new way to approach electronics. Pentacene is a promising candidate for OTFTs because of high mobility in crystalline form. In this study, we have systematically studied the effect of deposition rate of pentacene on device characteristics of OTFTs.

Based on deposition parameters (pentacene deposition rate) morphology of pentacene based OTFT observed with AFM is classified into five type's lamellar, pyramidal, inclined, dendritic and giant grains [1]. Above the growth temperature of 40°C, a notable structure was observed on any film surfaces called recessed regions. The observed structure is due to thermal stress induced structural transformation from thin film phase to bulk phase. This is a hindrance to mobility Also pentacene OTFT with good mobility are obtained with low deposition rate and high substrate temperature [2].

II. EXPERIMENTAL DETAILS

Here, we have successfully fabricated pentacene based OTFTs by physical vapor deposition (PVD). Highly doped silicon substrate with SiO₂ layer of thickness 2000Å has been used as a substrate. Then the pentacene was deposited on the SiO₂ layer by thermal evaporation. were fixed at 0.5, 1.0 & 1.5 nm/min and anneald at 80°C with varying time.

III. RESULTS & DISCUSSIONS

Drain current versus drain voltage plot of devices with different deposition rates shows the exact transistor behavior. Mobility values were calculated from drain current versus gate voltage plot. From Fig.1 it can be seen that drain current is increasing with increasing deposition rate. The exact reason for these phenomena is to be investigated.

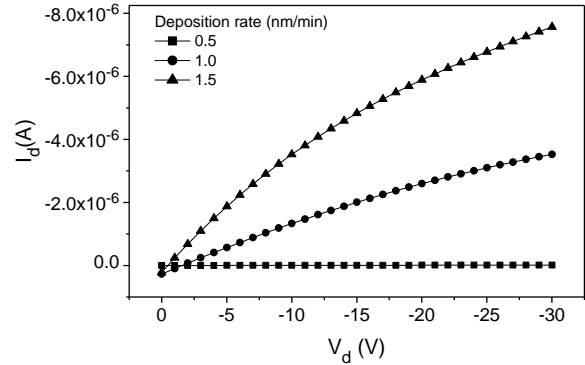


FIG.1. Drain current Vs drain voltage for a 50nm pentacene top contact OTFT as a function of deposition rate.

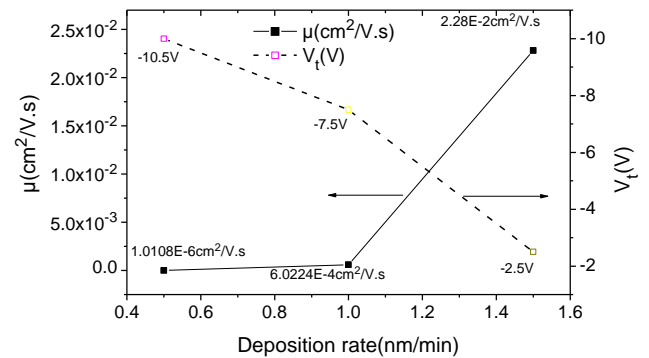


FIG. 2. Changes in mobility and threshold voltage of pentacene based OTFT as a function of deposition rate

IV. CONCLUSIONS

In conclusion, device characteristics field effect mobility and threshold voltage are extremely sensitive to processing condition of the pentacene and Au contacts in top contact OTFTs. Further optimization of dielectric processing and its surface treatment is to be explored to see their effect on device characteristics.

V. REFERENCES

- [1] H. Yanagisawa, T. Tamaki, Masakazu. Nakamura and K. Kudo, *Thin Solid Films*, **464**, 398 (2004).
- [2] R. Ruiz, D. Choudhary, B. Nickel, T. Toccoli, K.-C. Chang, Al. C. Mayer, P. Clancy, J. M. Blakely, R. L. Headrick, S. Iannotta and G. G. Malliaras, *Chem. Mater.*, **16**, 4497 (2004).

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All printed material, including text, illustrations, and charts, must be kept within a print area of 7-1/4 inches (18.4 cm) wide by 10 inches (25.4 cm) high. Do not write or print anything outside the print area. All *text* must be in a two-column format. Columns are to be 3-1/2 inches (8.84 cm) wide, with a 5/16 inch (0.8 cm) space between them. Text must be fully justified. All pages should begin 0.75 inch from the top edge and bottom margin should be 1 inch. The left and margin should be 0.50 inches.

2. Main title

The main title (on the first page) should begin 1-1/8 inches (2.97 cm) from the top edge of the page, 14 points, Times New Roman, centered, and boldface type. Capitalize the first letter of nouns, pronouns, verbs, adjectives, and adverbs; do not capitalize articles, coordinate conjunctions, or prepositions (unless the title begins with such a word). Leave two blank lines after the title.

3. Author name(s) and affiliation(s)

Author (s) name and affiliation (s) are to be centered beneath the title and printed in 11 points, Times New Roman, non-boldface type and also underlying the presenting authors. Affiliations are centered, italicized, not bold. Include e-mail addresses of corresponding author. Follow the author information by two blank lines before main text.

4. Abstract and index terms

The abstract is to be in fully-justified italicized text, at the top of the left-hand column, below the author information. Use the word "Abstract" as the title, in 9-point Times New Roman, boldface type, centered relative to the column, initially capitalized. The abstract is to be in 9-point, single-spaced type, and should be in 100 words long. Leave one blank lines after the abstract, then begin index terms with same format. After index terms, leave two blank lines then begin the main text. All manuscripts must be in English.

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Type your main text in 10-point Times New Roman, single-spaced. Do **not** use double-spacing. All paragraphs should be indented 1 pica (approximately 1/6- or 0.17-inch or 0.422 cm). Be sure your text is fully justified—that is, flush left and flush right. Please do not place any additional blank lines between paragraphs.

Figure and table captions should be 9-point Times New Roman and non-boldface. Callouts should be 9-point Times New Roman, non-boldface. Initially capitalize only the first word of each figure caption and table title. Figures and tables must be numbered separately. For example: "FIG. 1. Database contexts", "TABLE 1. Input data". Figure captions are to be justified and *below* the figures. Table titles are to be justified and *above* the tables. Leave one blank line between paragraph-figure and figure-figure captions. Follow the figure caption by one blank line before next paragraph.

TABLE 1. Significant parameters obtained from temperature dependence of threshold voltage (V_{th}) characteristics.

Intrinsic Layer Thickness (nm)	p_i/N_{HOMO}	$E_{Fi}-E_{HOMO}$ (eV)
75	1.4E-15	1.40
50	8.7E-15	1.39
25	1.1E-12	1.20

6. References

List and number all bibliographical references in 8-point Times New Roman, single-spaced, at the end of your paper. When referenced in the text, enclose the citation number in square brackets, for example [1]. Where appropriate, include the name(s) of editors of referenced books.

- [1] A.B. Smith, C.D. Jones, and E.F. Roberts, *Journal*, **volume**, page (year).
[2] Jones, C.D., A.B. Smith, and E.F. Roberts, *Book Title*, (Publisher, Location, Year).