# A concise and informative title suitable for facilitating information retrieval

Running title: a concise title

Running Authors: McGuire and Aydil (or McGuire et al. if more than 2 authors)

Gary McGuire [1] and Eray S. Aydil [2,a)]

[1]International Technology Center, P. O. Box 13740, Research Triangle Park, North Carolina 27709
[2]New York University, Tandon School of Engineering, Chemical and Biomolecular Engineering Department, 6 Metrotech Center, Brooklyn, NY 11201

[a)] Electronic mail: aydil@nyu.edu

The easiest way to generate your paper is to use this file and replace the text with the text of your article. For example, you can start typing your abstract here and replace this paragraph. You can delete sections and headings that you will not need. The abstract should be a summary of your article and summary of the new information presented. It should give the important conclusions of the article and any quantitative results of general interest. The abstract is used verbatim in abstracting and indexing services. Therefore, great care should be used in writing it. The abstract should be as specific and as brief as possible and no more than 500 words. Please avoid vague language and acronyms. Number all pages in sequence starting with this page. Page numbers are already inserted in this template.

# I. INTRODUCTION

MSWord format is acceptable for article files. Please use the built in equation tools of MS Word and avoid using outdated older tools such as Microsoft Math Editor.

The articles should begin with a brief "INTRODUCTION" section where the motivation for the work and background necessary to understand and appreciate the article is discussed. An ideal introduction begins with general background that would be easy to understand by someone who is not a specialist in the area, and becomes increasingly specific. This section should also describe why the work was done and establish novel aspects of what is being reported. The reported work should be put in the context of existing literature and avoid subjective and debatable words such as "first" or "for the first time." Introduction is also the appropriate section for a brief review of the important and relevant literature. Primary references should be used as much as possible. Please avoid referencing low circulation proceedings or conference abstract booklets. Classic and seminal papers and review articles that introduce key issues in the field are also appropriate references and should be used to guide the novice reader who wishes to learn more about the field. For very long articles, a paragraph that guides the reader through the organization of the paper may be useful and should also be included here.

The authors are responsible for the accuracy of the references. All names, dates, titles, abbreviations, and volume and page numbers should be double-checked before submission. All entries in the reference section must be cited in the text. The list of works cited should appear at the end of the body of the article without a heading. References should be numbered in the order of their first mention in the text. The citation may be used with or without the author's name: "… it has been shown by Johnson[5] that …" or "… experiments with calcium,[6] potassium,[7] and strontium[8] have shown…." Several

references may be cited together, the numbers being separated by commas: “several recent investigations[7,9,15] indicate….” If three or more consecutive references are cited together, an en-dash should be used between the lowest and highest reference numbers: “… while others[10–14] show that….” See the references at the end of this article for style. Please abbreviate journal titles. References should be styled using *References* style. Do not use word function *Insert/Endnotes*.

Please organize the body of the paper using first level headings such as “EXPERIMENTAL”, “EXPERIMENTAL SET UP AND METHODOLOGY”, “MODELLING”, “THEORY”, “OBSERVATIONS”, “RESULTS”, “DISCUSSION”, “RESULTS AND DISCUSSION”, “CONCLUSIONS”, etc. More descriptive headings such as “EXPERIMENTAL SET UP AND METHODOLOGY”, “COMPARISON BETWEEN EXPERIMENTS AND THEORY” are also appropriate and encouraged.

A number of styles have been defined for body text (*Para*) and headings (*Head1, Head2, Head3*). Do not type a number in front of headings or try to remove numbering applied by the style. The only styling you should do is proper capitalization and italicizing special characters as required.

# II. EXPERIMENTAL

The experimental procedures and calculations must be described clearly and enough information should be given such that they could be reproduced by other scientists.

## *A. Second level headings*

Use second level headings (style *Head2*) to further organize each section. For example, in the “MODELLING” section you may delineate “A. Gas phase modeling” and “B. Surface modeling.” In the experimental section you may want to organize your article using various experimental methods you used, etc.

### *B. Third level headings*

For most articles, two-level organization is adequate. In some case it may be necessary to include third level headings (style Head3) for finer organization of ideas. If you need third level headings, please use numbers as follows. Following is an example of how a section on device fabrication may be broken down.

#### *1. Gate dielectric deposition*

Details of gate dielectric deposition and any data associated with this step would be discussed here.

#### *2. Semiconductor deposition*

Details of semiconductor deposition and any data associated with this step would be discussed here.

#### *3. Contacts*

Issues related to how to make electrical contacts to the device may be presented and discussed here. Avoid very brief sections under third level headings.

## III. MODELLING

If your article does not include modeling, you do not need to have this section. If your article only contains modeling or theory, then you do not need a section entitled

EXPERIMENTAL. You can delete any sections that you do not need from this sample template.

## *A. Equations*

For a display equation, create or import the equation using MathType; you may select the program by choosing *Insert/Object* and then the appropriate program from the *Insert* menu (on the Create New tab). Once the equation is inserted, press <Tab> once and enter the equation number (if applicable) in parentheses; afterwards applying the style *DisplayEq*. Equations should be numbered on the right. All symbols should be defined the first time they appear

When referred to in the text, equations should be cited as Eq. (1), Eqs. (3)–(5); if the word "Equation" begins a sentence, it should be written out in full. If a parenthetical reference to an equation is made, the parenthesis around the number should be omitted, e.g., "A relationship (Eq. 4) can be derived…." A displayed equation should be treated grammatically as part of a sentence, and the text immediately preceding a displayed equation punctuated according to the position of the displayed equation in the sentence. (However, *punctuation should not be used within the display equation.*)

## *B. Tables*

Tables should not be submitted as graphics, but rather submitted as part of your manuscript (please ensure that there are no links to other data sources in any tables). Tables should be included just after they are introduced in the text and embedded in your paper. Use the styles *TableTitle, TableColHead, TableBody and TableFootnote* to produce your tables (from the styles menu). Following is an example.

TABLE I. The elemental composition of films sulfidized on sodal lime glass (SLG) and fused quartz (FQ) as determined by EDS. The standard deviations of four separate measurements at the same location on a nominally phase pure $Cu_2ZnSnS_4$ (CZTS) film (within the detection limits of XRD and Raman) are ±1.9 at%, ±1.4 at%, and ± 0.6 at% for Cu, Zn and Sn, respectively.

| | SLG | | | | FQ | | | |
|---|---|---|---|---|---|---|---|---|
| $T_s$(°C) | Cu | Zn | Sn | S | Cu | Zn | Sn | S |
| Precursor | 50 | 18 | 32 | 0 | 49 | 21 | 30 | 0 |
| 100 | 50 | 19 | 31 | 0 | 50 | 23 | 28 | 0 |
| 200 | 45 | 27 | 24 | 4 | 42 | 24 | 26 | 8 |
| 300 | 34 | 6 | 11 | 49 | 31 | 11 | 9 | 49 |
| 400 | 24 | 13 | 13 | 50 | 27 | 10 | 14 | 49 |
| 500 | 25 | 12 | 14 | 49 | 25 | 11 | 14 | 50 |
| 600 | 25 | 13 | 13 | 49 | 27 | 10 | 14 | 49 |

## *C. Figures*

Figures should be prepared with care and embedded in the text when they are first discussed. Please prepare illustrations in the final published size, not oversized or undersized. Size your illustrations 3-3/8" wide for single column and 6-3/4" wide for double column figures. Submit each illustration at the final size you wish it to appear in the journal. The standard is 8.5-cm maximum width (3-3/8” or 20.5 picas) for one column. Ensure a minimum of 8-point type size (2.8 mm high; 1/8” high) and that line weights will be 0.5 points or greater in the final published size. Avoid inconsistencies in lettering within individual figures, and from one figure to the next. Please ensure that the

production quality figures are at least 600 DPI. Each figure should include all parts of the figure. For example, if Figure contains three parts (a, b, c), then all of the parts should be on the same page. All the panels in multi-panel figures should be labeled as a, b, c, etc. Please do not use "top", bottom", "left", "right", etc. The labels should be in one of the corners and clearly visible. Each panel should be described in the figure caption with reference to these panel labels. Please consider your panel layout carefully and keeping in mind that most figures are published in single column width (3 3/8" wide). If you need to publish any figure as double column please prepare them 6 3/4" wide and let us know in your cover letter, which figures you wish to publish as double column. Figure 1 is an example of a figure that would be published as single column. Figure 2 is an example of a figure that would be published as double column. In some cases, it may be better to arrange the panels on multi-panel figures vertically rather than side by side. This would avoid them becoming unreadable when reduced to single column width. Color online is free and use of color is encouraged. However, please try to choose the symbols and line types for your plots such that when printed or viewed in black and white the readers can still distinguish the data. Use of color is still encouraged.

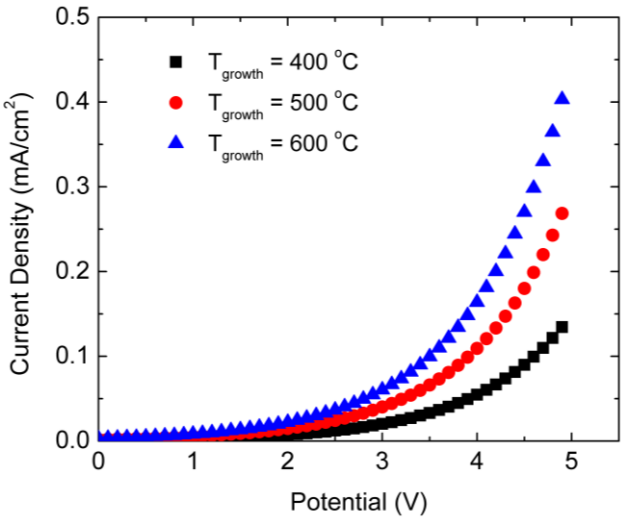


FIG. 1. Current-voltage characteristics of diodes made from films grown at three different temperatures. This is an example of a figure that would be published as single column. It is approximately 3 3/8” (8.5 cm) wide.

Once a paper is accepted, separate figure files will be required for final production by the American Institute of Physics (AIP) who prepares the proofs. At this final stage, individual figure files should be submitted and in one of the following formats: PostScript, EPS, TIFF or production- ready PDF (Creating a Production-Ready PDF image) files. The AVS Publications Office encourages authors to embed the figures into the text file and to go ahead and submit the separate figure files at the time of submission or revision.

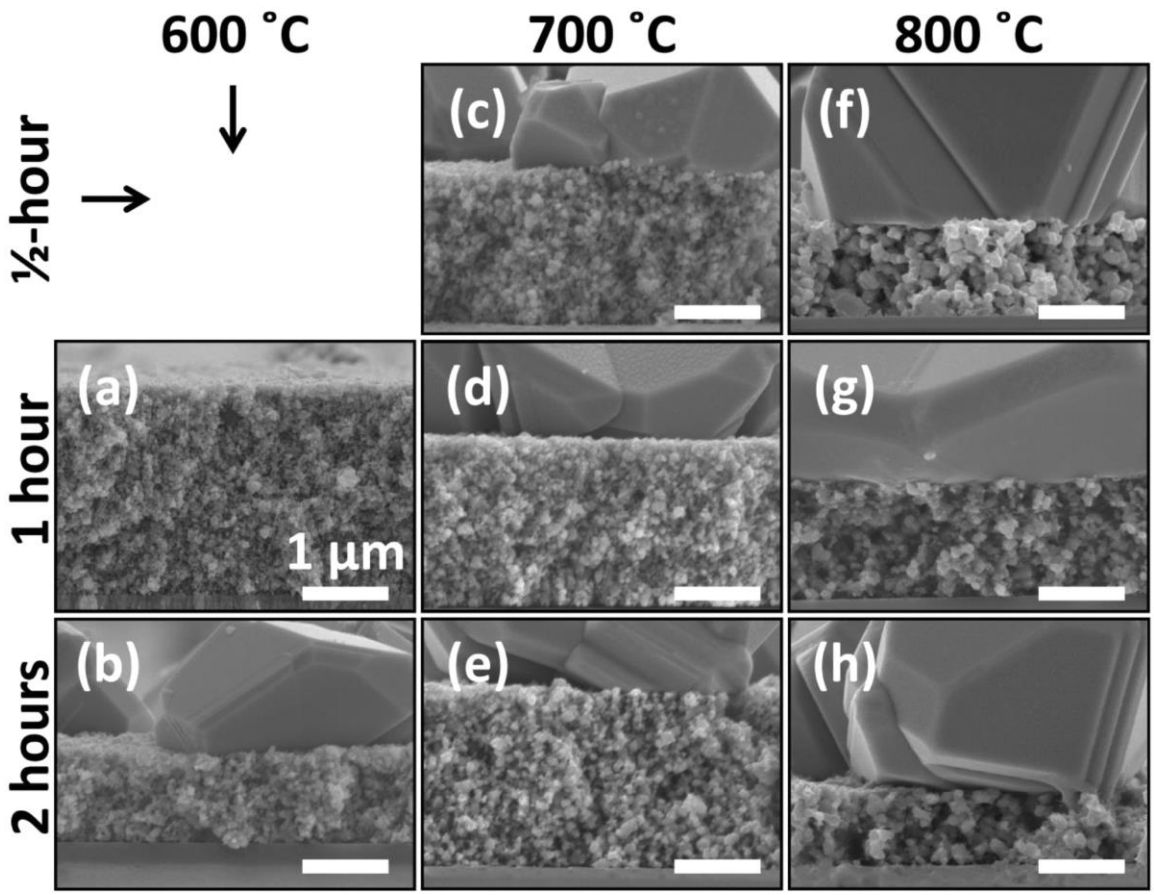



FIG. 2. This is an example of a figure prepared for double column publication. Cross-sectional SEM images of copper zinc tin sulfide films after annealing at (a, b) 600 °C, (c-e) 700°C, and (f-h) 800 °C for (c,f) 30 min, (a,d,g) 1 h, and (b,e,h) 2 h. All scale bars are 1 μm.

Figure 1 is an example of an embedded figure with a caption. Figure captions should be concise but complete. Please use punctuation and complete sentences. Please use *FigCap* style for figure captions. If presenting experimental data, you may want to summarize the experimental conditions. If presenting modeling or theoretical results you may want to include the values of the parameters. All micrographs and photographs should have a scale bar and scale. All graph axes should have a title and units, preferably in parenthesis. Legends should be as descriptive and as brief as possible. Please avoid

cryptic legends, sample numbers, etc. If you must use sample numbers, symbols or abbreviations please define them in the figure caption.

# IV. RESULTS AND DISCUSSION

## *A. Result A*

Use secondary headings suitable for presenting the results of your article. In the results and discussion section, it may be helpful to organize your results by major points you wish to communicate. In these cases, it may be helpful to think of the second level headings as brief newspaper headlines that quickly communicate a particular result. For example, “Persistent photoconductivity” or “Chlorine plasma etches silicon,” etc.

## *B. Method B*

Alternatively, you can organize the results and discussion section by method used to arrive at conclusions, for example, “Auger spectroscopy results,” “Current-voltage measurements,” etc. Whatever organization method you choose; the main goal is to help the reader get the most out of your article.

## *C. Discussion*

If appropriate, you can follow the results and observations with a discussion in a section entitled Discussion. Alternatively, such discussion is included with the results above.

# V. SUMMARY AND CONCLUSIONS

Please provide a concise summary of what was done or studied. Summarize what was learned and concluded. A few sentence on future perspectives or remarks on next

steps for research in the area may also be appropriate here. Please do not repeat the abstract verbatim.

## SUPPLEMENTAL MATERIAL

If your submission includes Supplemental Material, it should be mentioned within your manuscript in one of the following ways:

1. This statement in the paper where appropriate (for example in a section titled “Supplemental Material” as above): "See supplementary material at [URL will be inserted by AIP Publishing] for [give brief description of material]."
2. A reference in the Reference section noting "See supplementary material at [URL will be inserted by AIP Publishing] for [give brief description of material]." See References below for an example. That reference should then be included in the text wherever appropriate.

With either option, please leave the "[URL will be inserted by AIP Publishing]", but remove the brackets from your brief description of the material.

## ACKNOWLEDGMENTS

Acknowledge grants and other people who have contributed to the work (other than authors) here. Any funding information provided in your Acknowledgements should also be listed in your manuscript details in the submission system. Under “Manuscript Information”, please click on "Publication Charges and Funding". Enter any funding

sources in the "Funding Sources" section. Please be concise. Acknowledgements text should be styled as *AckText.* Acknowledgement title should be styled as *AckHead.*

## DATA AVAILABILITY

Your manuscript must include a data availability statement. The data statement of your choice should be placed after the Acknowledgments and before the References and titled "Data Availability". When data is available elsewhere, provide a citation of the data in your reference list. For instructions and templates on how to create your statement and reference, please visit https://publishing.aip.org/wp-content/uploads/2020/02/AIPP-Data_Availability_Statement-Jan2020.pdf.

## REFERENCES

[1]D. A. Oulianov, R. A. Crowell, D. J. Gosztola, I. A. Shkrob, O. J. Korovyanko, and R. C. Rey-de-Castro, J. Appl. Phys. **101,** 053102 (2007).

[2]A. J. Elliot, "Rate constants and G-Values for the simulation of the radiolysis of light water over the range 0-300C," AECL Report No. 11073, Chalk River Laboratories, Chalk River, Ontario, Canada (1994).

[3]Y. Tabata, I. Itoh, and S. Tagawa, *CRC Handbook of Radiation Chemistry* (CRC Press, Boca Raton, 1991).

[4]Y. Young, *Physics in Today's World,* edited by A. Newman (Springer, New York, 1999), Vol. 2, pp. 62–68.

[5]J. Nelson, U.S. Patent No. 5,693,000 (12 December 2005).

[6]See supplementary material at [URL will be inserted by AIP Publishing] for [give brief description of material].