

How open research can accelerate the fabrication of solution processed devices

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Introduction

Solution processed thin-film transistors (TFTs) are a growing area of interest for fabricating flexible, sustainable, lightweight electronics [1-3]. Unlike conventional fabrication techniques which often require a clean room, specialist equipment, high vacuum and high temperature, solution processing is inexpensive and easy to learn making it perfect for developing new devices with different materials.

Open research can help accelerate the fabrication of solution processed devices by making recipes and data freely available. This poster discusses the current challenges that solution processing faces, the proposed methods to be carried out and proposed open research practices.

Challenges

Although solution processing provides a greener and inexpensive alternative to conventional fabrication techniques, it is not widely talked about outside of the field suggesting that the research is not yet open to interdisciplinary groups and the public. With only 17.4% of papers being open access (Fig. 1), it can be difficult for new ideas to gain momentum which can be detrimental to ongoing research and potential future funding.

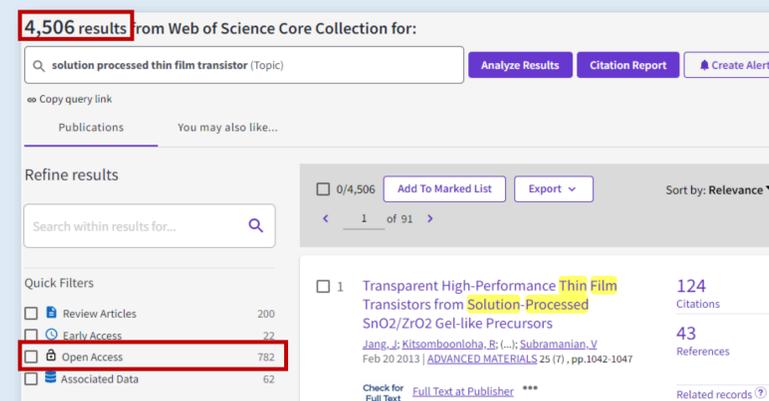


Figure 1. Only 782 out of 4506 results are open access when searching for “solution processed thin film transistor”. Results taken from Web of Science, Clarivate (accessed 14th March 2022).

Proposed Methods

Solution processing can be applied to any material that can be deposited as a solution (semiconductors, insulators and metals). Recipes can be found in many journals, each documenting the materials used and processes in detail, allowing for other researchers to repeat experiments.

The recipes will need to be optimised to fit the equipment, materials, device geometry and laboratory conditions. The electrical behaviour and material of the devices can be characterised to help tune recipes and fabrication processes. Once the process has been optimised, the recipe, steps, and implementation should be documented in detail to be easily shared in papers and other publications.

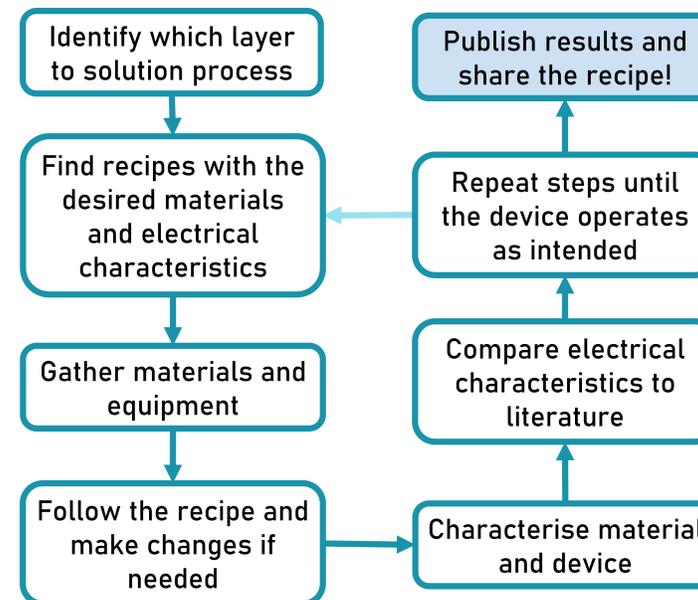


Figure 2. Flow chart of fabrication process.

This research will lead to fabricating new solution processed devices and circuits - protection of intellectual property (IP) is crucial and needs to be discussed before the publishing stage of the project. This step can be time consuming and delay publications, but it is necessary to ensure that hard work is not lost. Once IP protection is in place, the work can be shared through open access journals and even to the general public.

Proposed Open Research Practices

There are many ways to practice open research, each bringing unique value to the project.

Publishing in open access journals allows researchers from other fields without access to specific journals to contribute to the topic. For example, “solution processing” benefits greatly from researchers with a background in chemistry. Open access papers also have larger impact as they are more likely to be picked up by websites and news outlets, leading to greater interest on the topic [4, 5].

Social media (LinkedIn, Twitter) allow ideas to be condensed and shared in a digestible manner, which can help lesser-known research gain interest outside of their field whilst also encouraging open interdisciplinary discussion. Additionally, there has been a growing trend of scientific communicators sharing ideas and research in through short form videos [6]. Videos can disseminate information to younger audiences in a fun and engaging manner, inspiring them to consider a future in research and broadening their knowledge.

In conclusion, practicing open research through open access papers, social media posts and short form videos can bring many benefits such as new global collaborations, increased funding and greater interdisciplinary expertise. Therefore, accelerating the fabrication of solution processed devices.

Further information

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