Perovskite solar cells made by a self-quenching method using a volatile perovskite ink with safer alternatives to toxic 2-methoxyethanol

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In 2024, certified efficiency over 26% has been demonstrated using Perovskite Solar Cells.[1] Also, many progresses have been done on encapsulation to improve their stability.[2] These results are showing their potential for the next generation of photovoltaic device. This explain why some industrials are now investigating this field and start to build their pilot and fabrication lines. So far most of high efficiency devices have been achieved using the DMF / DMSO solvent system with an antisolvent step using chlorobenzene.[3] This approach is very sensitive to the antisolvent step and has a narrow processing window which might make it difficult to scale up. Other approaches rely on the use of nitrogen or vacuum quenching which might be costly due to the high amount of high purity gas use during the nitrogen quenching step and the slow speed of the vacuum quenching respectively.[4] Here we present our work on a relatively unexplored solvent system based on acetonitrile and glycol ether solvent such as 2-methoxyethanol. We propose 4 new alternatives to 2-methoxyethanol which are less toxic and can be used to tailor the perovskite ink properties. These solvents allow to form the perovskite layer without any external quenching step. We show that by spin coating our perovskite ink the intermediate phase form only 3 to 5 seconds after the spin coating started and that high efficiency device can be realize using this approach.

References:

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