Highly efficient and flexible perovskite indoor solar cells using butyl acetate as a greener antisolvent

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Flexible perovskite solar cells have attracted great interest recently due to low-cost fabrication, high power conversion efficiency (PCE), and outstanding mechanical flexibility. Using antisolvent is an important protocol to synthesize high quality perovskite thin films. Toxic antisolvents such as chlorobenzene (CB) are necessary to promote control of morphology. This study proposes a greener anti-solvent, butyl acetate (BA). It shows lower toxicity but has the similar physical properties with CB. The difference between the solubility parameters of anti-solvents and dimethyl sulfoxide (DMSO) determines the volume of residual DMSO within Perovskite–DMSO complexes. Dropping BA during spin coating leaves excess DMSO more effectively than CB due to a larger difference in solubility parameters with DMSO. The controlled nucleation and growth of perovskite grains results in large grain sizes (>1 μm). Enlarged grains reduce trap density and improve charge carrier mobility, showing enhancement of device performance (PCE>19%) and environmental stability. Our flexible devices are available as indoor light energy harvesters with a high maximum power density of 0.063 mW cm^{-2}.