Roll-to-roll processed polymer tandem solar cells partially processed from water

Large area polymer tandem solar cells completely processed using roll-to-roll (R2R) coating and printing techniques are demonstrated. A stable tandem structure was achieved by the use of orthogonal ink solvents for the coating of all layers, including both active layers. Processing solvents included water, alcohols and chlorobenzene. Open-circuit voltages close to the expected sum of sub cell voltages were achieved, while the overall efficiency of the tandem cells was found to be limited by the low yielding back cell, which was processed from water based ink. Many of the challenges associated with upscaling the multilayer tandem cells were identified giving valuable information for future experiments and development.