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The use of gold chloride as the oxidant for the chemical synthesis of conducting polymers results in the formation of conducting polymer particles incorporating metallic gold nanoparticles.[1] It is well known that metallic gold is soluble in iodide solutions such as the acetonitrile/iodide/triiodide electrolyte used in DSSCs. If required, the gold particles can be removed from the PEDOT by soaking in DSSC electrolyte solution for 24 hours – no gold particles were observed via TEM analysis of the PEDOT after soaking in the electrolyte solution, whereas the metal incorporation is clearly visible in the un-soaked material, as shown in Figure 1. The performance of the PEDOT that has had the gold particles removed is comparable to that of the PEDOT before gold removal (Figure 2). The spread in the data is slightly larger, but the difference in the efficiencies of the best two cells is only 0.08%, which is statistically insignificant. If the gold particles were contributing to the solar cell performance then their removal would result in a considerably larger drop in efficiency than is observed.

It is also worth noting that the electrowinning of gold from iodide solutions is a well established technology,[2] thereby potentially enabling a route to the recovery of the gold after the PEDOT synthesis, making the material even more cost effective compared to platinum.

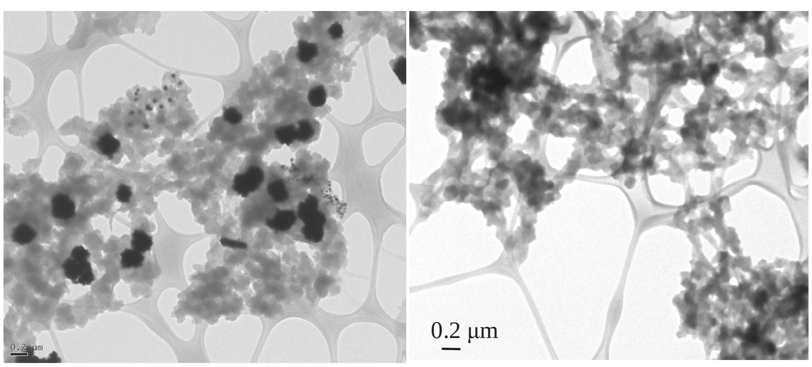

Figure 1. TEM analysis of the PEDOT before (left) and after (right) soaking in the acetonitrile/iodide/triiodide DSSC electrolyte solution, showing removal of the gold nanoparticles (scale bars both 0.2 µm).

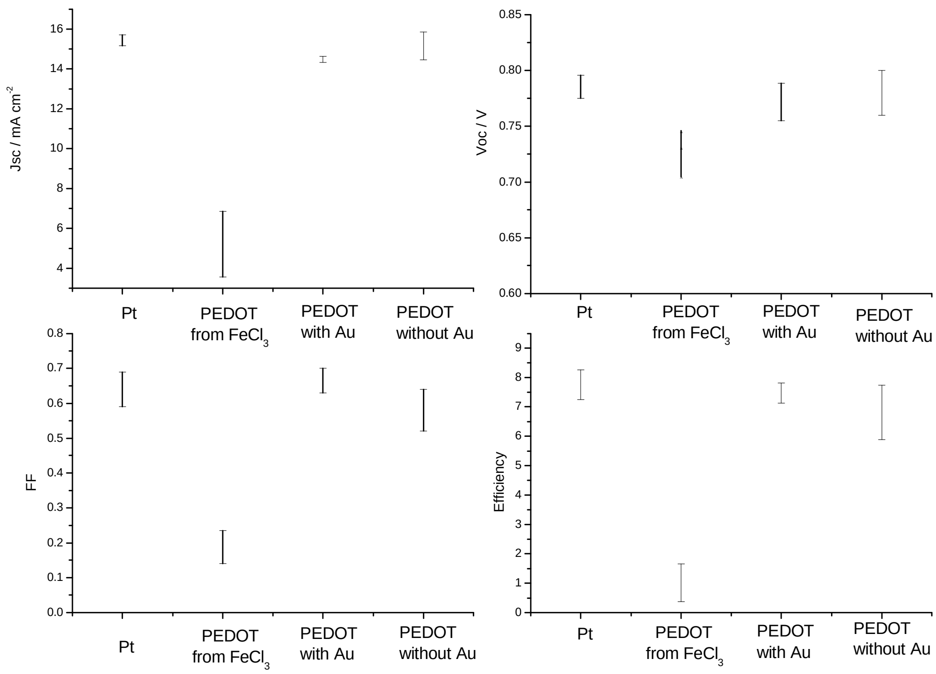

Figure 2. Comparison of the photovoltaic parameters of DSSCs using different materials on FTO as counter electrodes; Pt, PEDOT made from $FeCl_3$, PEDOT made from $AuCl_3$, and PEDOT made from $AuCl_3$ followed by soaking an acetonitrile/iodide/triiodide solution to remove the residual gold. The bars show the range of values obtained within the batch of cells, with $n \geq 3$.

[1] J. M. Pringle, O. Winther-Jensen, C. Lynam, G. G. Wallace, M. Forsyth, D. R. MacFarlane, *Adv. Funct. Mater.* **2008**, *18*, 2031.

[2] J. Leibovitz, (Leibovitz, Jacques, USA). Application: WO, **1998**, p. 46 pp.