

## Supplementary Information

# Circular Recycling Concept of Silver from Photovoltaic Cells in Ethaline Deep Eutectic Solvent

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In Fig. S1 are reported the voltammograms recorded before and after silver leaching, using different concentrations of  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ . Before leaching, only the peaks related to the  $\text{Fe}^{2+}/\text{Fe}^{3+}$  redox couple appear around 0 V vs  $\text{Fe}^{2+/3+}$ . After leaching, the oxidation and reduction peaks of  $\text{Ag}/\text{Ag}^+$  are visible at lower potentials. As the immersed area of the electrode remains unchanged, the increase of silver peaks intensity following the increase in iron concentration means that silver concentration also increases. However, the ratio  $i_{\text{Ag}}/i_{\text{Fe}}$  of reduction peaks increases from 0.03 to 0.40 mol.L<sup>-1</sup> but drops from this last value, while it should be proportional with the concentration introduced in oxidative agent. It reveals a limitation in relation with the  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  concentration. In Fig. S1b and S1c, an additional signal can be noticed at -0.05 V vs  $\text{Fe}^{2+/3+}$ . It might arise from the formation of iron oxide at the surface of the electrode in the presence of air and water in the DES, this one being opened to the air and hygroscopic.

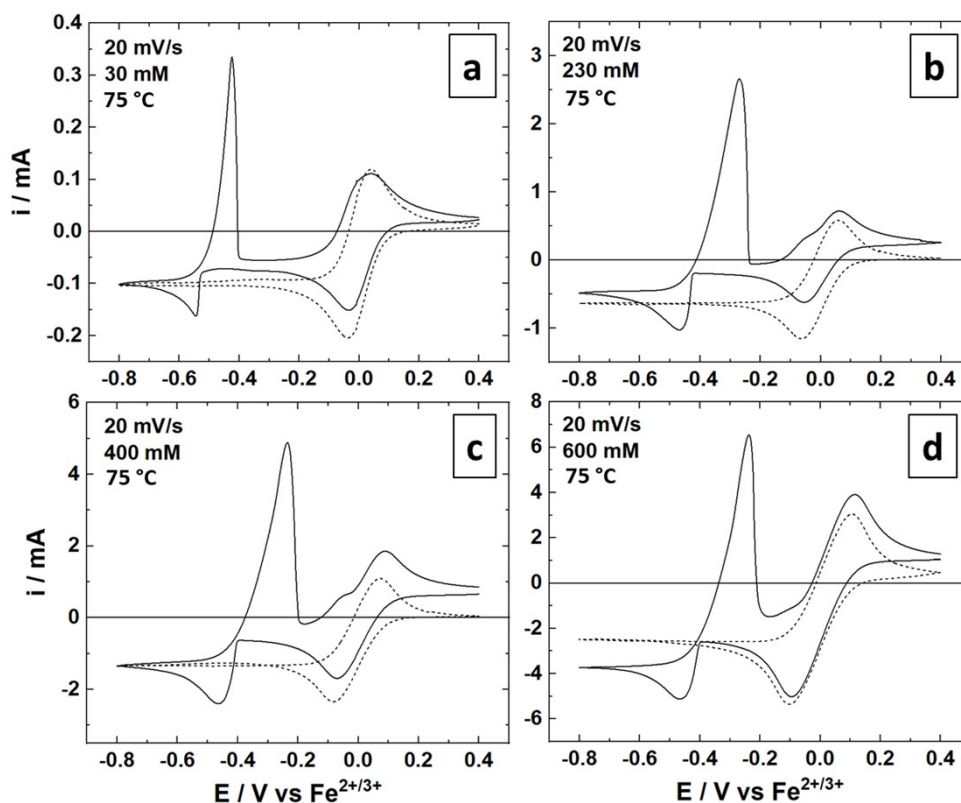


Figure S1. Voltammograms of Pt wire at 20 mV.s<sup>-1</sup> and 75 °C before (dash line) and after (full line) 16 h of leaching with a) 0.03 mol.L<sup>-1</sup>, b) 0.23 mol.L<sup>-1</sup>, c) 0.40 mol.L<sup>-1</sup> and d) 0.60 mol.L<sup>-1</sup> of  $\text{Fe}^{3+}$ .

Fig. S2 shows the evolution of the silver reduction and oxidation peaks after each step of PV cell scraps leaching. The increase of intensity indicates the enrichment of the leachate in silver ions.

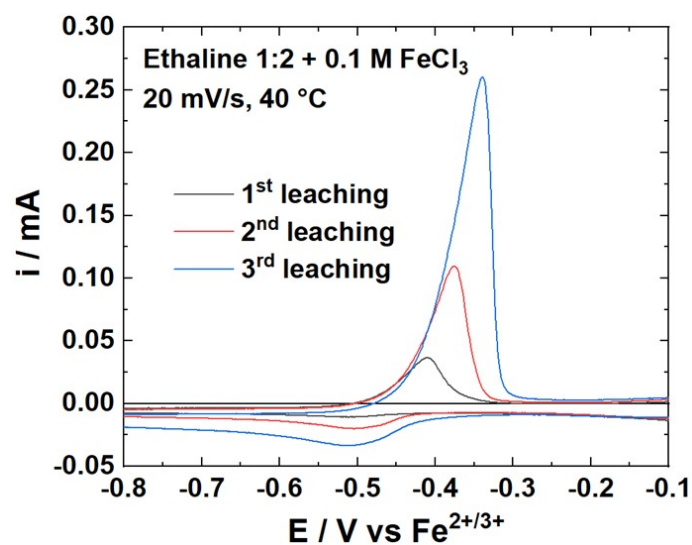


Figure S2. Voltammograms of Pt wire at 20  $\text{mV}\cdot\text{s}^{-1}$  and 40 °C in PV cell leachate after each step.

Ag deposit was attempted from the PV cell scraps leachate under air atmosphere at 50 °C. The current was set at 0.90  $\text{mA}\cdot\text{cm}^{-2}$  during 30 min under stirring, and the potential was measured at -15 mV vs Ag/AgCl. The deposit showed a bad adhesion to the platinum support and a yellow color. The SEM image (10 kV voltage) of this deposit displayed in Fig. S3 reveals its poor density and the flake-like morphology of the particles.

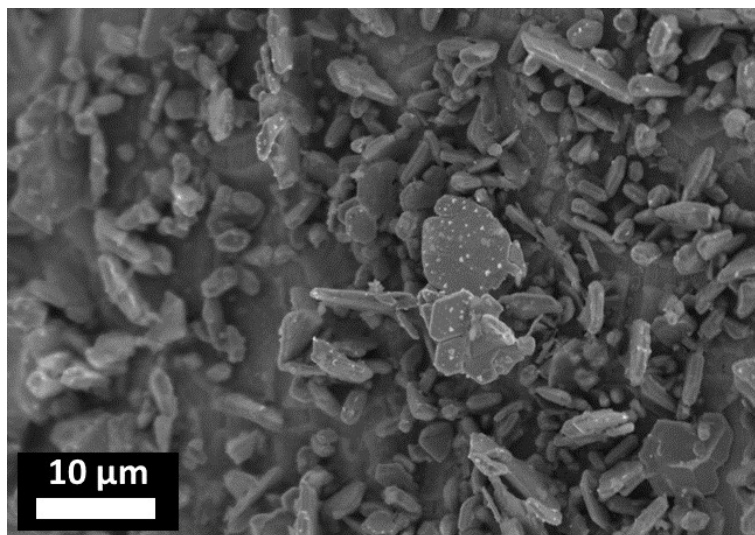


Figure S3. SEM image of the deposit obtained under air.

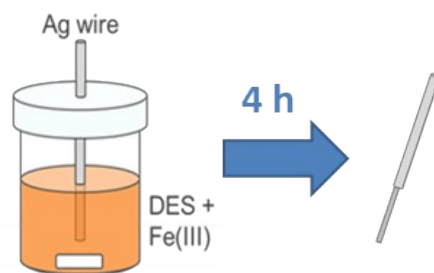


Figure S4. Leaching of Ag wire to determine the leaching rate by gravimetry.

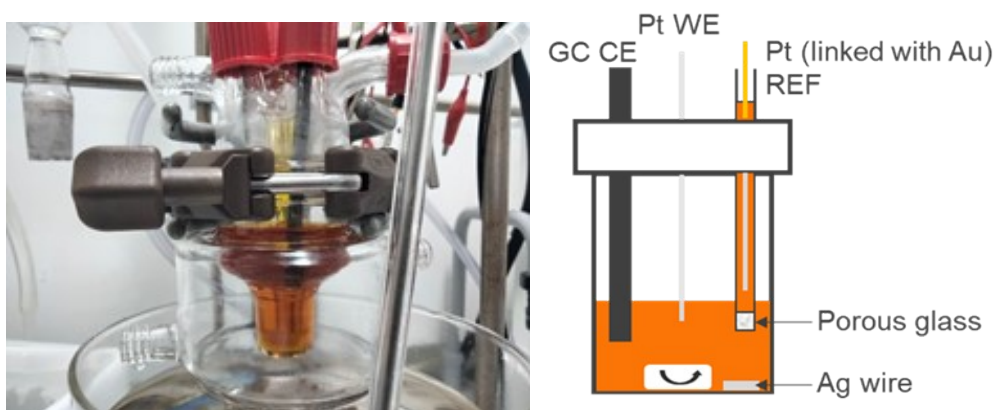


Figure S5. Three-electrode cell used for electrochemical investigation and its simplified representation.



Figure S6. Leaching reactor for PV cells, equipped with helix stirring.

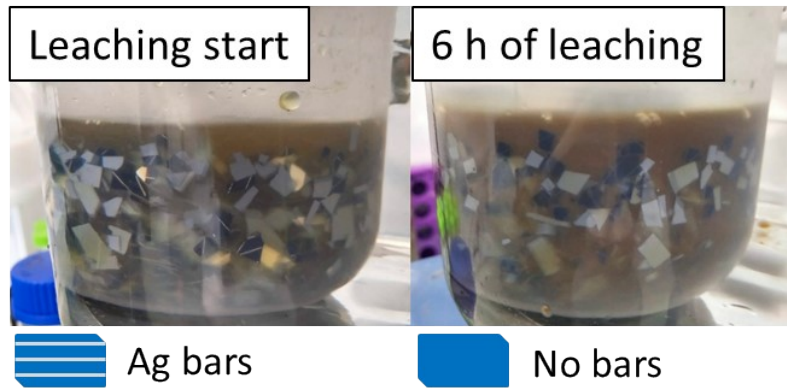


Figure S7. Comparison of surface aspect of PV cells before and after 6 h of leaching.