Electronic Supplementary Material (ESI) for RSC Sustainability.

Recovery of palladium from waste fashion items through food waste by-products

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Plating process to obtained the Pd-coated wires

The plating process to obtain the (waste) Pd-coated wires consisted of the following steps: (i) chemical pickling of the items to be plated with fluorides, to dissolve silica and dust; (ii) ultrasound treatment in a cyanide alkaline bath; (iii) cathodic and anodic degreasing; (iv) cathodic alkaline copper cyanide pre-plating of the item to cover with copper all the items, regardless of their original material; (v) washing, to prevent cyanide transfer into the acidic environment; (vi) cathodic, acid copper sulphate plating, to increase the thickness of the copper deposit; (vii) cathodic nickel sulfate deposit; (viii) ultrathin (0.01-0.05 μm) gold deposit, using a bath containing $KAu(CN)_4$; (ix) final thin (0.10-0.30 μm) palladium deposit, using a bath containing $Pd(NH_3)_4SO_4$.

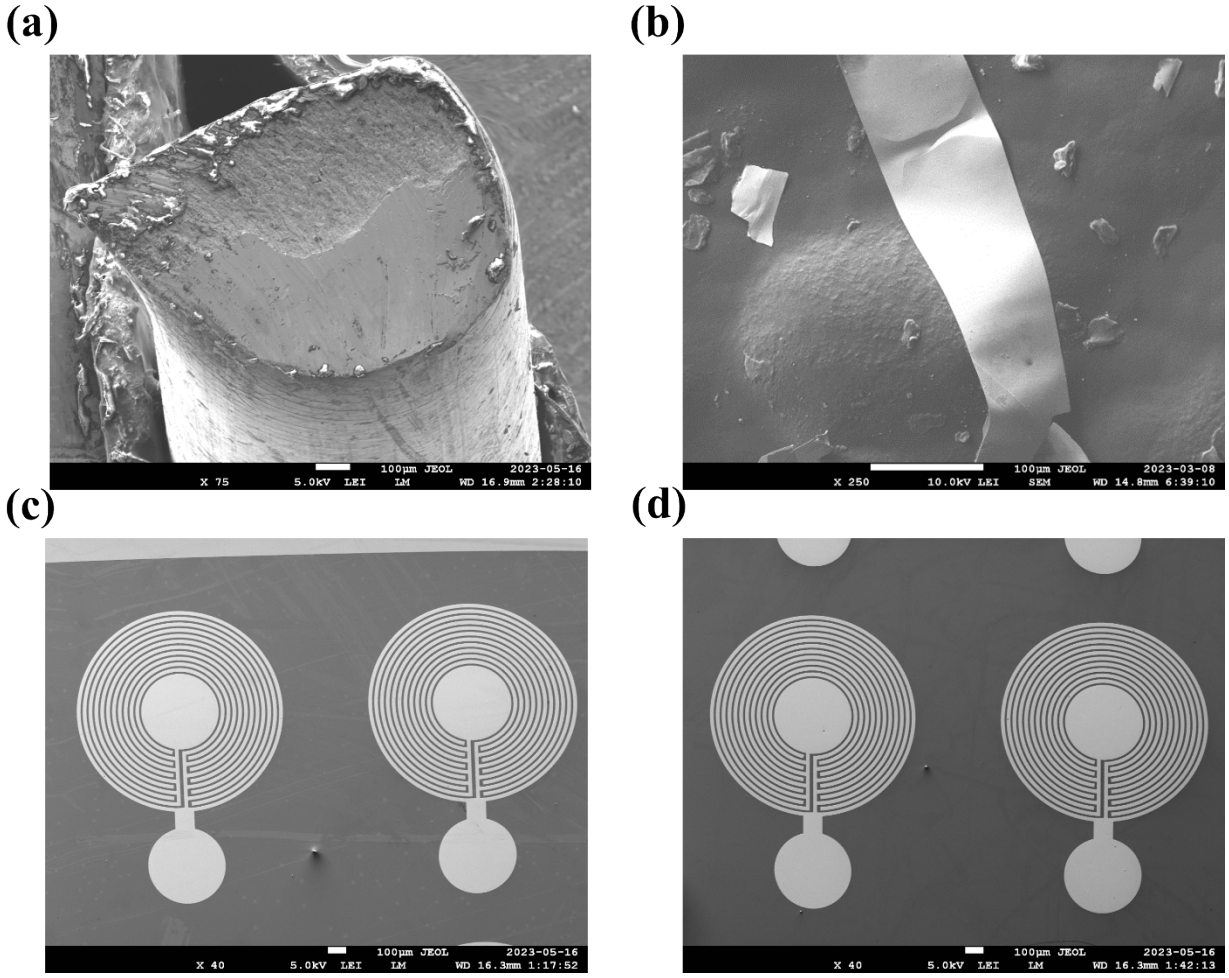

Figure S1. Scanning Electron Microscopy images: (a) cross section of a waste wire; (b) peeled flakes; (c) microfabricated electrodes e-beam evaporated from recycled Pd; (d) microfabricated electrodes e-beam evaporated from commercial Pd.

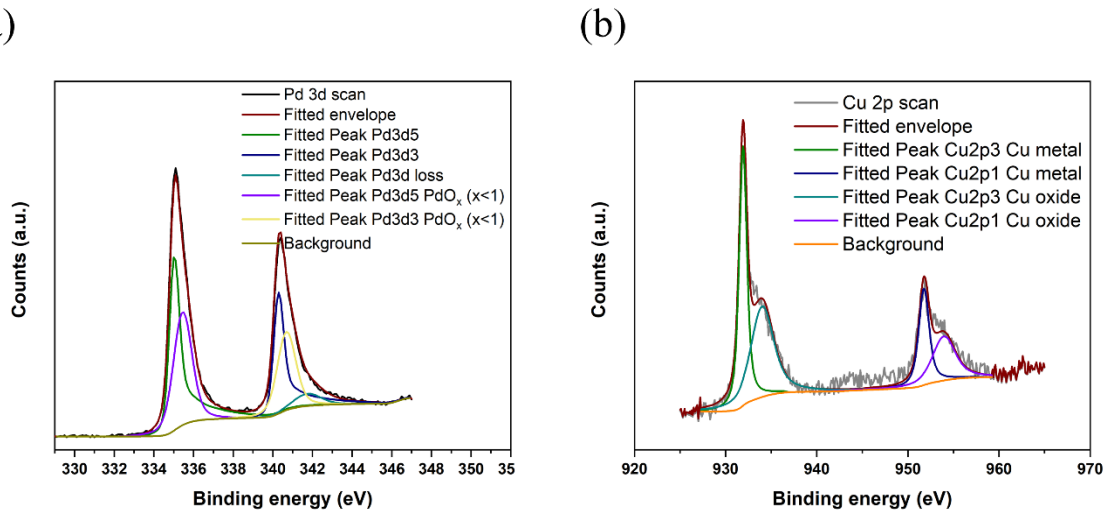

Figure S2. High resolution XPS scan of waste wires.

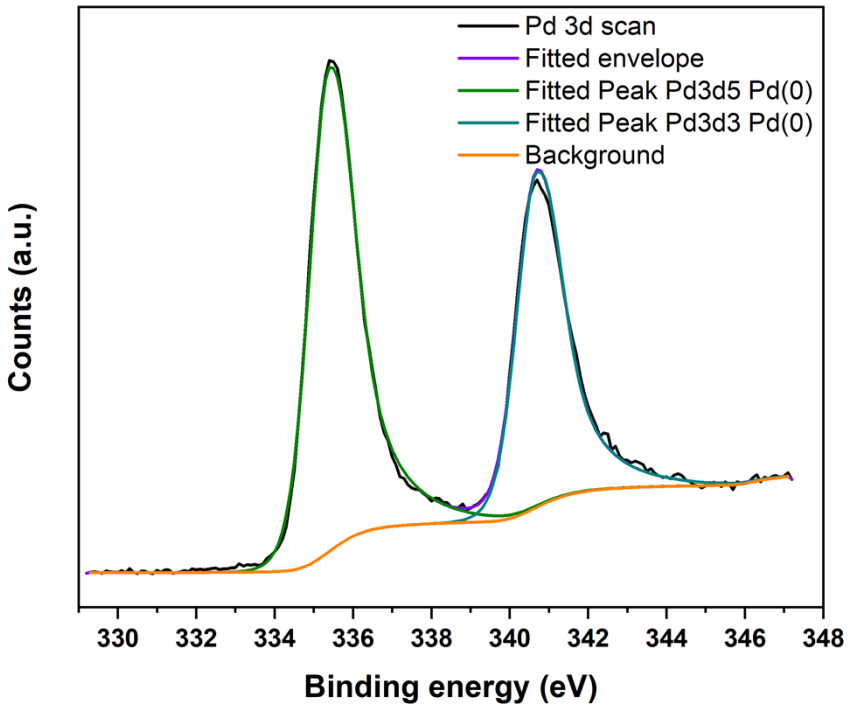

Figure S3. High resolution XPS scan of peeled flakes from waste wires.

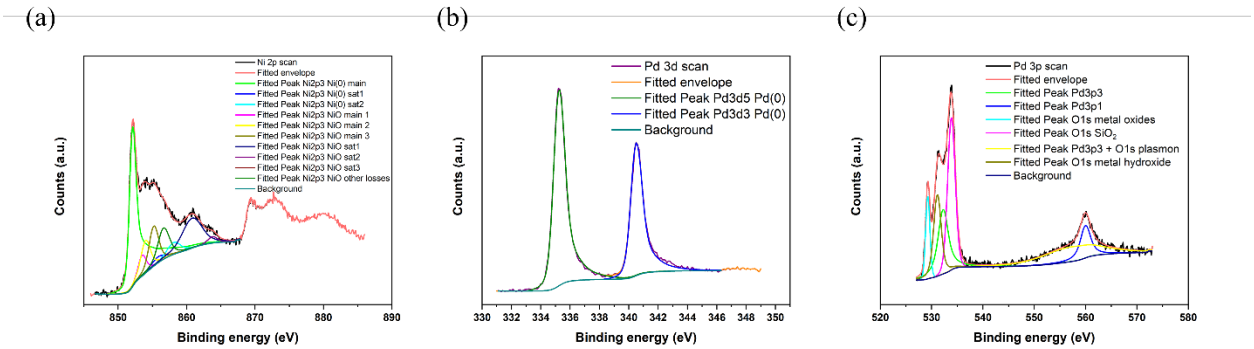

Figure S4. High resolution XPS scan of e-beam evaporated electrodes from recycled Pd.

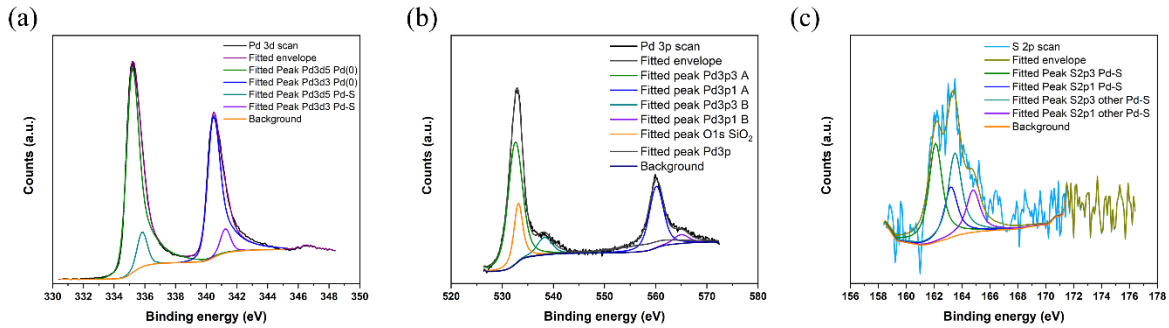

Figure S5. High resolution XPS scan of e-beam evaporated electrodes from commercial Pd.

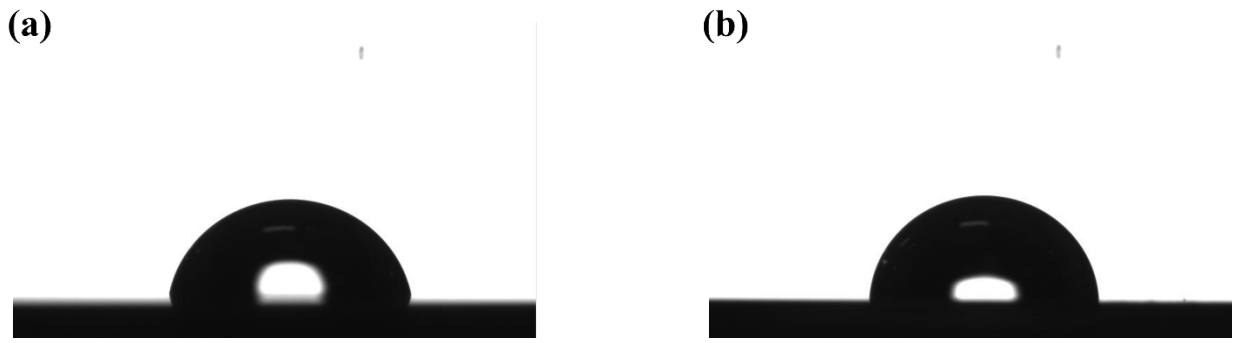

Figure S6. Water contact angle on surfaces of Pd electrodes e-beam evaporated from: (a) recycled Pd and (b) commercial Pd.

Table S1. Chemical elements detected by EDS and XPS in the samples investigated in this work.

	EDS	XPS
Wires	Pd, Cu, Au, N, Ni, Zn, O	Pd, C, Cu
Peeled Flakes	Pd	Cu, Ni, Ag, Pd, C, Cl
e-beam evaporated electrodes from recycled Pd	Si, O, Ni, Pd, Fe, Mn, N	Ni, Pd, Si, C, O

Table S2. Atomic percent and binding energy of the thermally evaporated recycled and commercial Pd electrodes, flakes and wires obtained from XPS characterization.

Element	**Commercial evaporated**		**Recycled evaporated**		**Flakes**		**Wires**	
	Atomic percent (%)	Binding Energy (eV)	Atomic Percent (%)	Binding Energy (eV)	Atomic Percent (%)	Binding Energy (eV)	Atomic Percent (%)	Binding Energy (eV)
O 2s	31.4	24.8	46.0	26.3				
O 1s								
Si 2p	14.2	102.3						
Si 2s			10.2	155.5				
C 1s			5.0	284.9	45.6	285.3	18.3	284.7
S 2p	3.1	161.4						
Pd 3d	51.3	334.0	10.7	335.8	42.5	335.8	77.2	335.6
Ni 2p			28.1	853.7	2.4	854.3		
Cl 2p					2.1	198.3		
Ag 3d					4.3	368.0		
Cu 2p					3.1	932.0	4.5	932.4