Solvometallurgical recovery of antimony from waste polyvinyl chloride plastic and co-extraction of organic additives

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Electronic supplementary information (ESI)

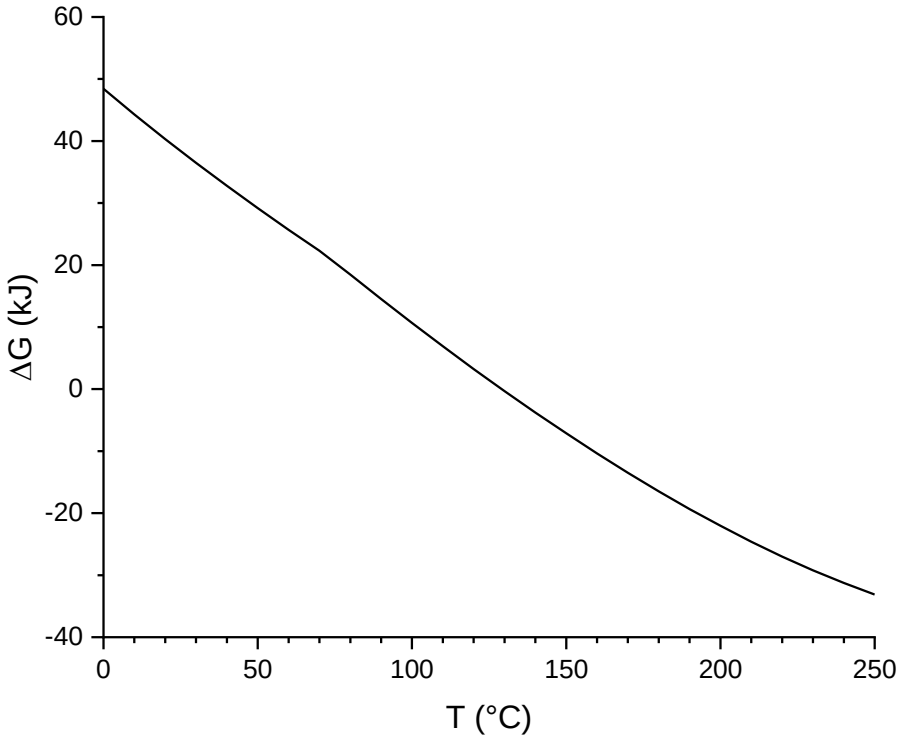

Figure S1 Gibbs free energy for the reaction Sb2O5 + 3HCl → 2SbCl3 + 3H2O, as modelled by HSC Chemistry v8.0 software.

Figure S2 Photos of the PVC sample (left) as receive; (middle) cut in 1x1 cm flakes; (right) cryogenically milled to <4 mm.

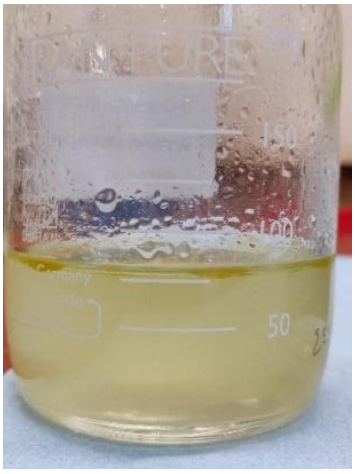

Figure S3 Photo of FR1 after ethanol removal by distillation.

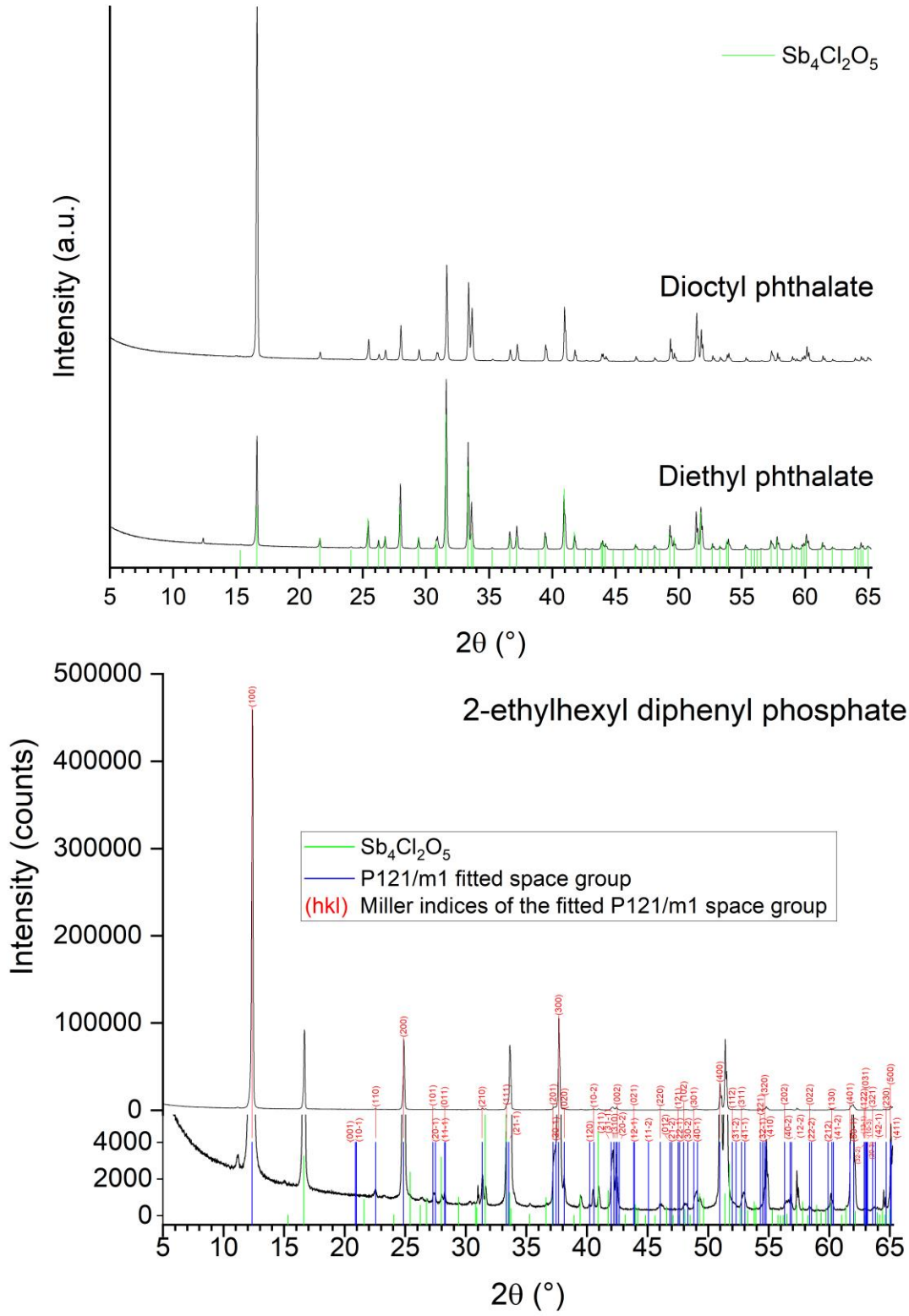

Figure S4 XRD diffractograms of the precipitates formed by hydrolysis precipitation of an acidic $SbCl_3$ solution in the presence of (top) phthalates and (bottom) 2-ethylhexyl diphenyl phosphate. In the bottom graph the peak positions of a fitted space group (P121/m1, a = 8.691(4) Å, b = 5.477(3) Å, c = 5.160(3) Å, β = 106.856(8)°) are plotted, accompanied by their respective Miller indices.

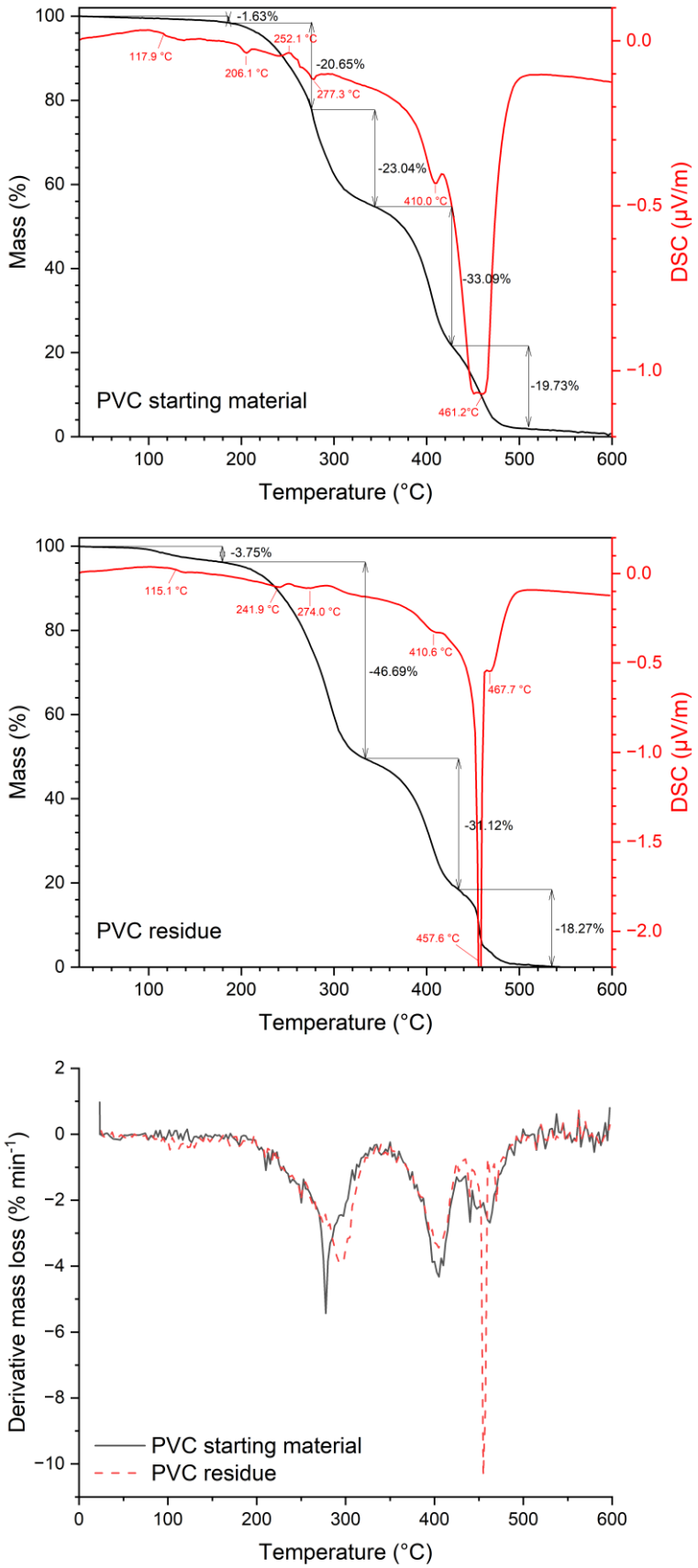

Figure S5 DSC and TGA curves of the original cryogenically milled PVC sample (top) and the residue obtained after leaching in 4 M ethanolic HCl solution at 80 °C for 4 h (bottom). The derivative mass loss of the two samples is shown in the graph at the bottom.

Table S1 Average pH of 2 M, 4 M and 6 M HCl aqueous and ethanolic solutions after leaching reactions at 50 °C and 80 °C. Standard deviations are given as error.

[HCl] (M)	Average pH aqueous solution	Average pH ethanolic solution
2	-0.095 ± 0.149	-0.422 ± 0.151
4	-0.682 ± 0.108	-1.029 ± 0.027
6	-0.848 ± 0.288	-1.272 ± 0.018