Electronic Supplementary Information

Purification of crude $In(OH)_3$ using the functionalized ionic liquid betainium bis(trifluoromethylsulfonyl)imide

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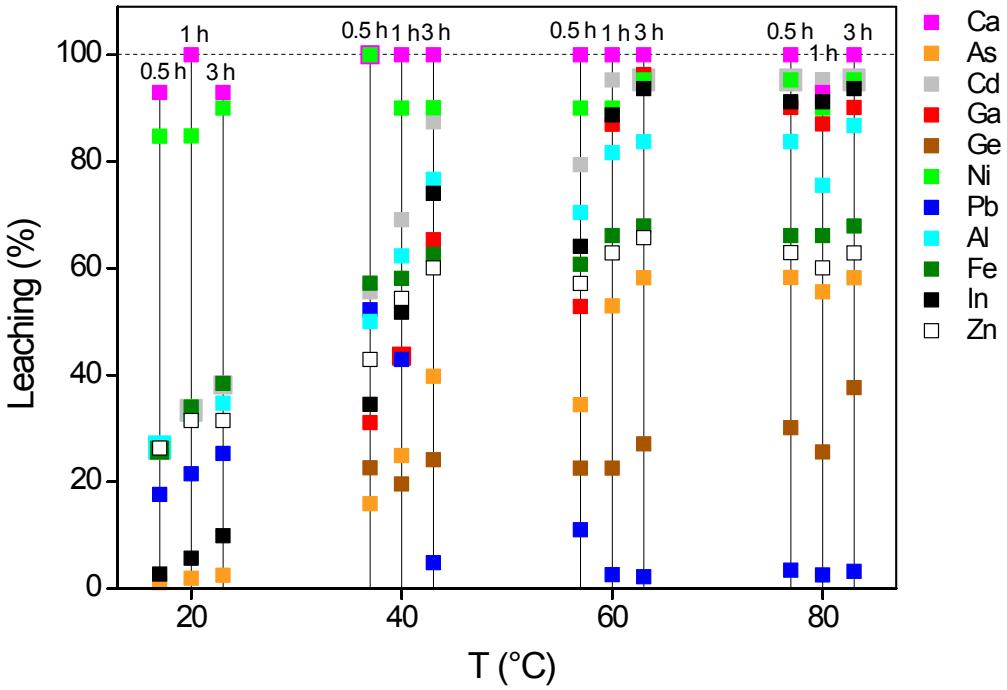

Fig. S1 Leaching of metals (%) from crude $In(OH)_3$ in water-saturated [Hbet][Tf_2N] as a function of temperature and reaction time. The Ga and Ge contents were below the detection limit of 1 ppm at 20 °C and the Sb, Se, Sn and Te contents were below the detection limit of 1 ppm at all temperatures so that these elements have been excluded from the graph.

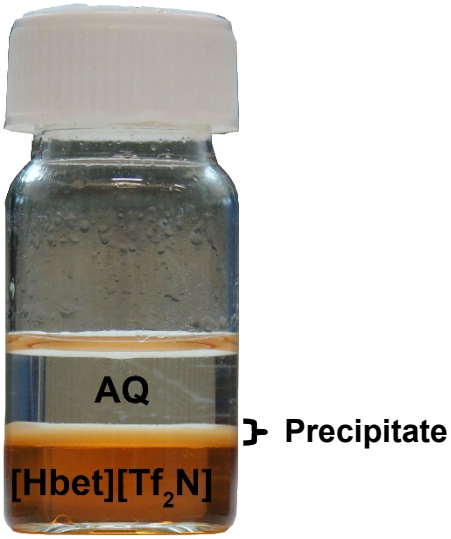

Fig. S2 Filtrate obtained after filtration of the 1:0.5 wt/wt [Hbet][Tf2N]–H_2O mixture after leaching of the crude $In(OH)_3$ for 1 h at 80 °C. Phase separation of the aqueous phase and the ionic liquid phase occurred with precipitate formation at the interphase after cooling the filtrate to room temperature.

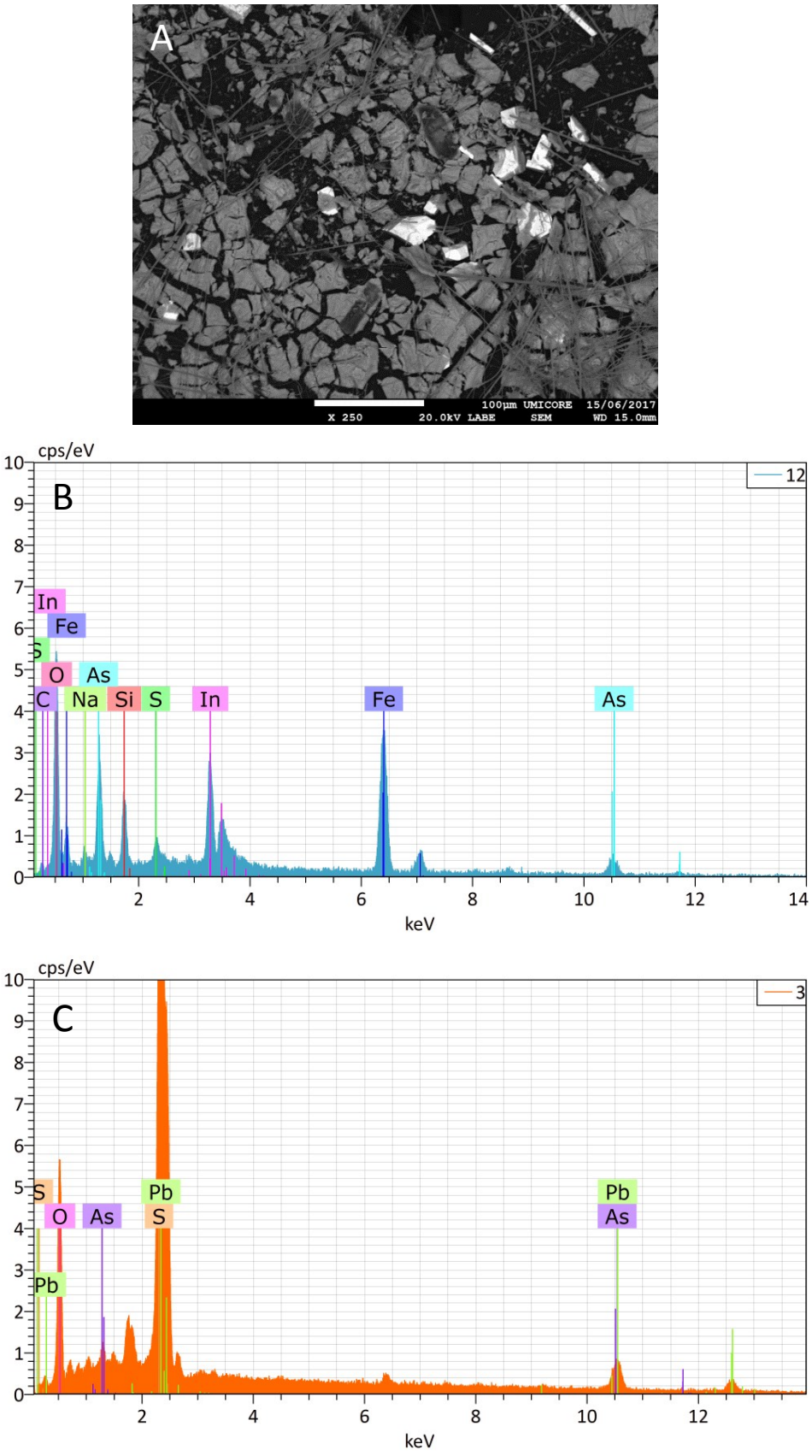

Fig. S3 SEM picture (A) and corresponding EDS spectra of the grey (B) and white particles (C) of the precipitate formed at the interphase after phase separation due to cooling of the filtrate obtained after filtration of the 1:0.5 wt/wt [Hbet][Tf_2N]–H_2O mixture after leaching of the crude $In(OH)_3$ for 1 h at 80 °C.

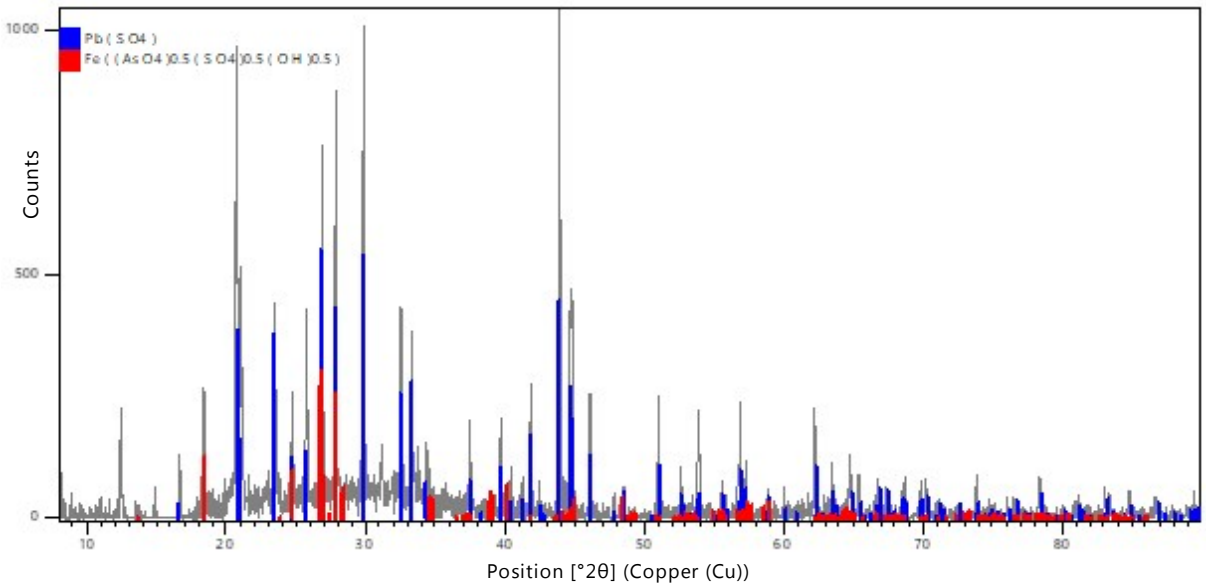

Fig. S4 XRD of the precipitate formed at the interphase after phase separation due to cooling of the filtrate obtained after filtration of the 1:0.5 wt/wt [Hbet][Tf_2N]–H_2O mixture after leaching of the crude $In(OH)_3$ for 1 h at 80 °C.

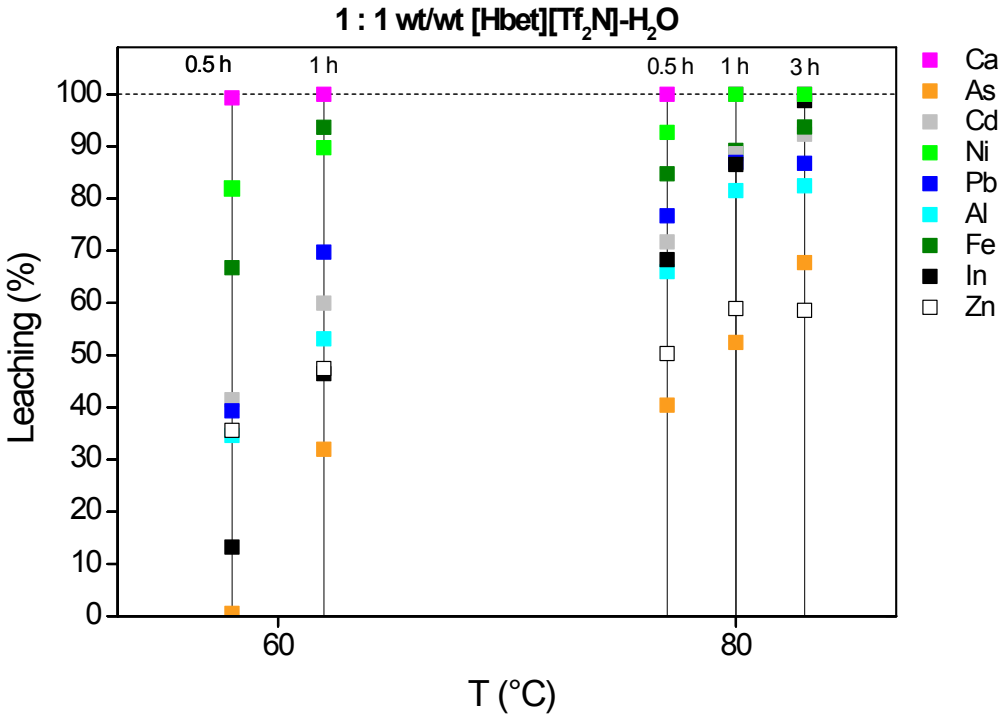

Fig. S5 Leaching of metals (%) from crude $In(OH)_3$ in a 1:1 wt/wt mixture of [Hbet][Tf_2N]–H_2O as a function of temperature and reaction time. The concentrations of Ga, Ge, Sb, Se, Sn and Te were below the detection limit (<1 ppm) so these elements have been excluded from the graph.

Table S1 Percentage leaching (%*L*) and corresponding standard deviation (s) of metals from crude $In(OH)_3$ in a 1:1 wt/wt mixture of $[Hbet][Tf_2N]$–H_2O as a function of temperature and reaction time.

	60 °C				80 °C					
	30 min		1 h		30 min		1 h		3 h	
Element	*%E*	s	*%E*	s	*%E*	s	*%E*	s	*%E*	s
As	0.51	0	32	10	40	3	53	5	68	4
Cd	41	1	60	6	72	6	89	10	92	6
Ni	82	3	90	9	93	13	100	6	100	7
Pb	39	2	70	4	77	6	87	9	87	5
Al	34	1	53	3	66	1	82	3	83	7
Ca	99	5	100	0	100	0	100	21	100	0
Fe	67	3	94	1	85	1	89	7	93	1
In	13	3	47	8	68	1	87	4	99	4
Zn	36	0	47	5	50	4	59	9	59	4

Table S2 Distribution ratio (*D*) and corresponding standard deviation (s) of metals from crude $In(OH)_3$ in a 1:1 wt/wt mixture of $[Hbet][Tf_2N]$–H_2O as a function of temperature and reaction time.

	60 °C				80 °C					
	30 min		1 h		30 min		1 h		3 h	
Element	*D*	s	*D*	s	*D*	s	*D*	s	*D*	s
As	1.3	0	1.8	0.3	1.9	0	2.4	0.3	3.3	0.2
Cd	0.20	0.03	0.16	0.01	0.19	0.03	0.13	0.05	0.13	0.03
Ni	0.20	0.06	0.14	0	0.14	0.01	0.11	0.02	0.12	0.04
Pb	2.0	0.1	1.7	0.1	1.5	0.1	1.3	0	1.3	0.1
Al	0.14	0.01	0.09	0.02	0.092	0.023	0.061	0.008	0.050	0.008
Ca	0.23	0.01	0.22	0	0.19	0	0.16	0.03	0.18	0
Fe	19	10	42	8	46	8	42	9	39	8
In	24	15	29	4	39	16	32	11	28	5
Zn	0.12	0	0.11	0	0.098	0.003	0.079	0.003	0.073	0.006

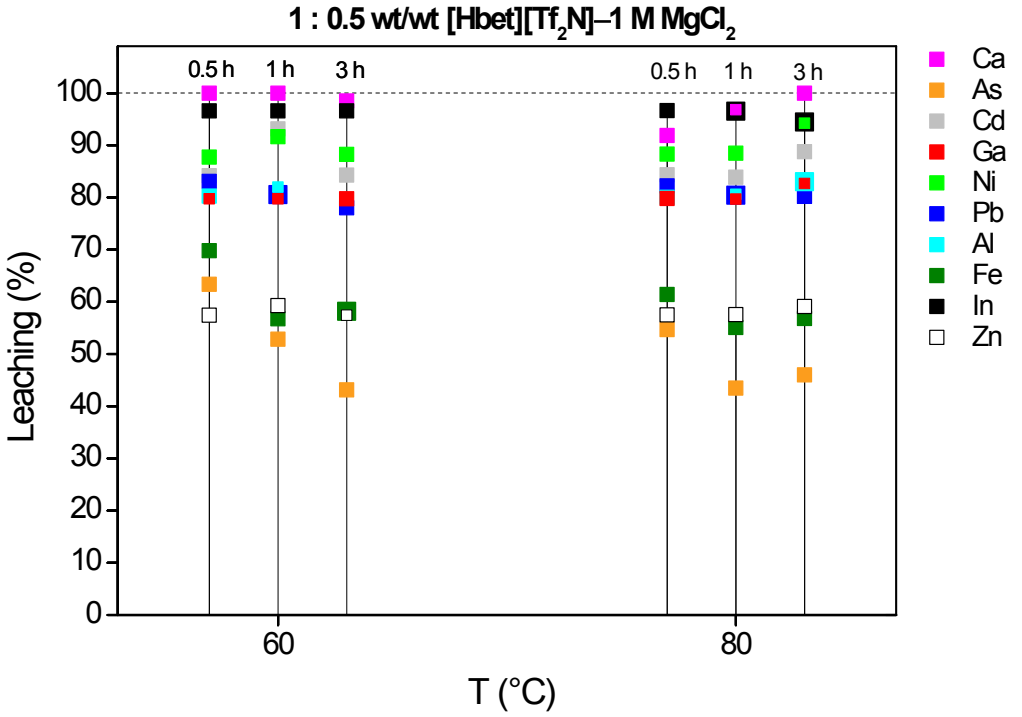

Fig. S6 Leaching of metals (%) from crude $In(OH)_3$ in a 1:0.5 wt/wt mixture of [Hbet][Tf_2N]–1 M $MgCl_2$ as a function of temperature and reaction time. The concentrations of Ge, Sb, Se, Sn and Te were below the detection limit (<1 ppm) so these elements have been excluded from the graph.

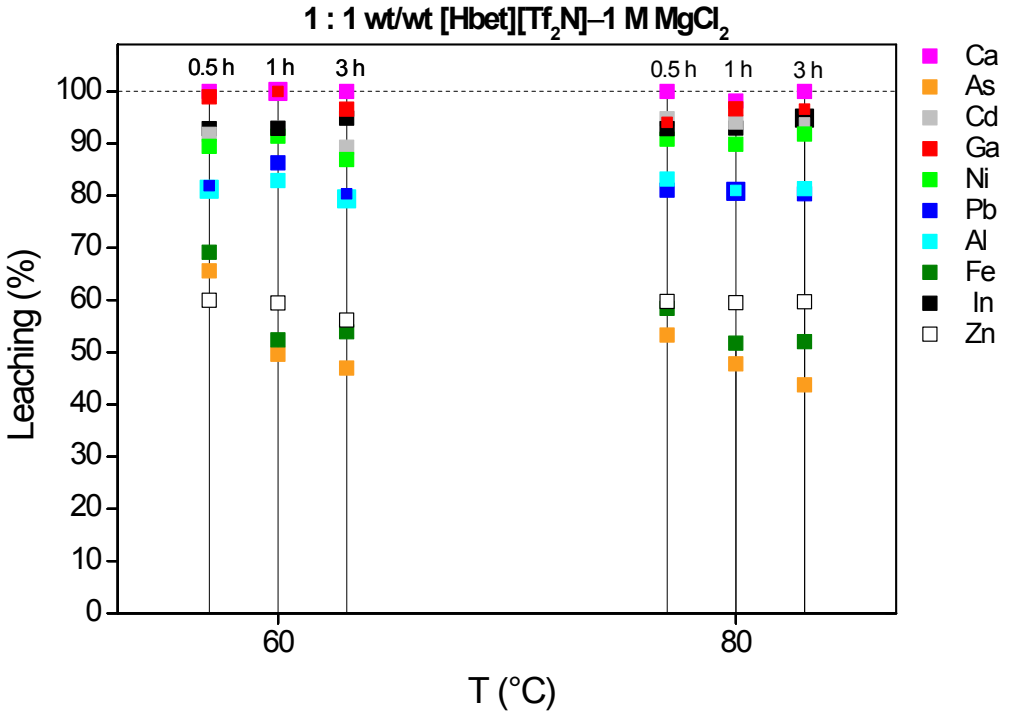

Fig. S7 Leaching of metals (%) from crude $In(OH)_3$ in a 1:1 wt/wt mixture of [Hbet][Tf_2N]–1 M $MgCl_2$ as a function of temperature and reaction time. The concentrations of Ge, Sb, Se, Sn and Te were below the detection limit (<1 ppm) so these elements have been excluded from the graph.

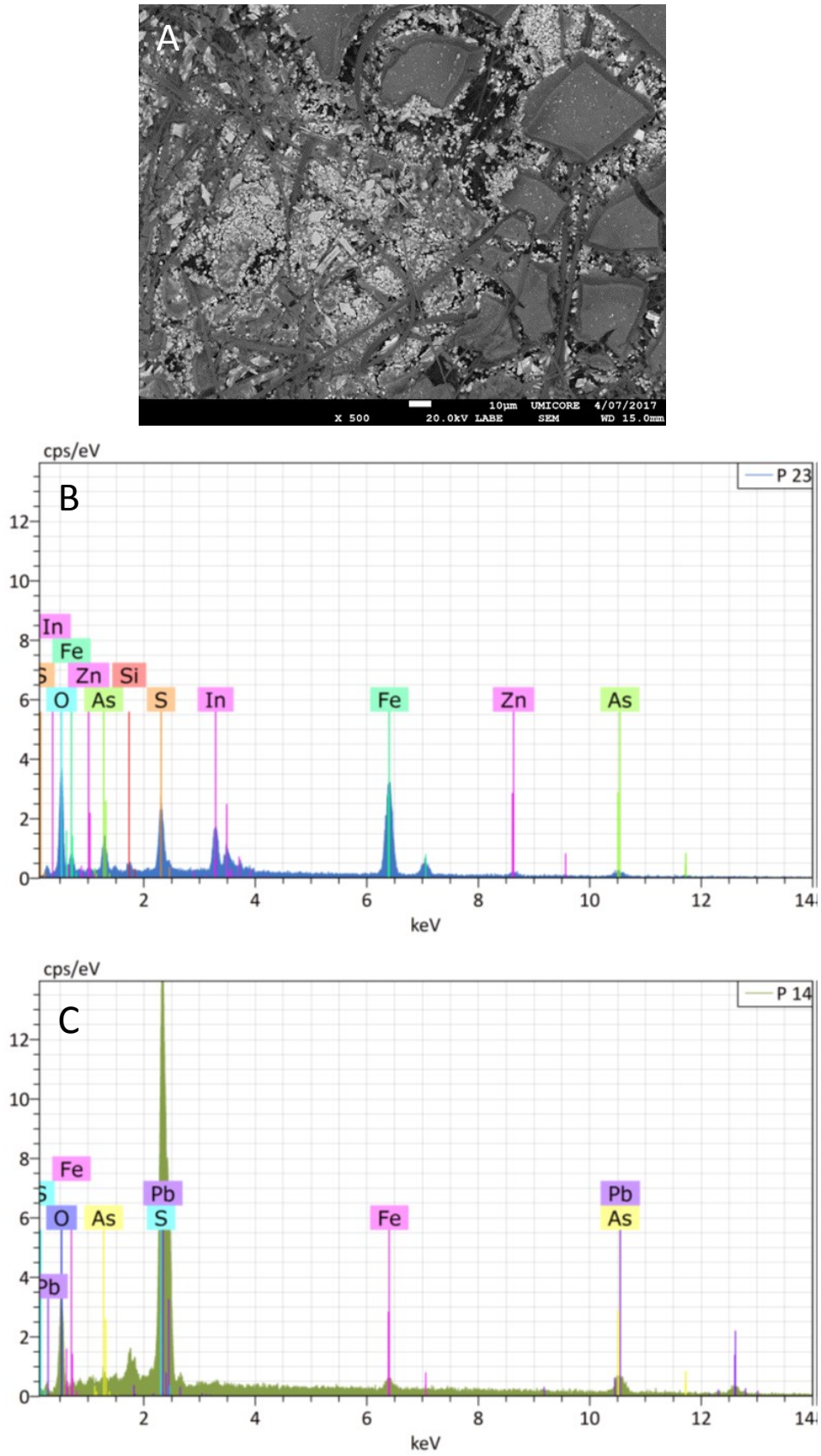

Fig. S8 SEM picture (A) and corresponding EDS spectra of the grey (B) and white particles (C) of the precipitate formed after stripping the loaded ionic liquid phase with 1.5 N H_2SO_4. The loaded ionic liquid phase was obtained after leaching crude $In(OH)_3$ in the 1:1 wt/wt [Hbet][Tf_2N]–H_2O mixture for 3 h at 80 °C.