Supplementary Information

Table S1: Bulk geochemistry of total REE extracted accumulated from steps 1-7 of sequential extraction. Units of total amount extracted are mg/kg (mg element extracted per kg underclay).

	Sc	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Y	Ho	Er	Tm	Yb	Lu	**REE**
WV MKT underclay	3	0	2	0	2	1	0.5	4	0.8	4	18	0.6	1	0.1	1	0.1	**62**
WV MKT coarse coal refuse	2	0	2	0	0	0	0.1	0	0.1	0	2	0.1	0	0.0	0	0.0	**6**
central PA LKT underclay	1	0	0	0	0	0	0.0	0	0.0	0	1	0.1	0	0.0	0	0.0	**3**
central PA MKT underclay	2	2	6	1	5	1	0.0	3	0.4	2	15	0.4	1	0.1	0	0.1	**40**

Table S2: Bulk geochemistry of total extracted elements accumulated from steps 1-7 of sequential extraction. Units of total amount extracted are mg/kg (mg element extracted per kg underclay).

	Mg	Al	Si	P	K	Ca	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Ba	Th	U
WV MKT underclay	745	1780	12,053	1118	1277	3564	4	82	11,521	57	91	56	141	35	90	6	1.1
WV MKT coarse coal refuse	318	1560	1140	19	1009	1186	3	13	1542	7	12	21	34	1	45	1	0.5

central PA MKT underclay	187	648	499	14	736	878	1	16	181	4	8	10	46	0	30	1	0.5
central PA MKT underclay	816	1585	1854	17,156	1545	19,655	4	55	4363	13	37	39	91	10	168	1	4.3

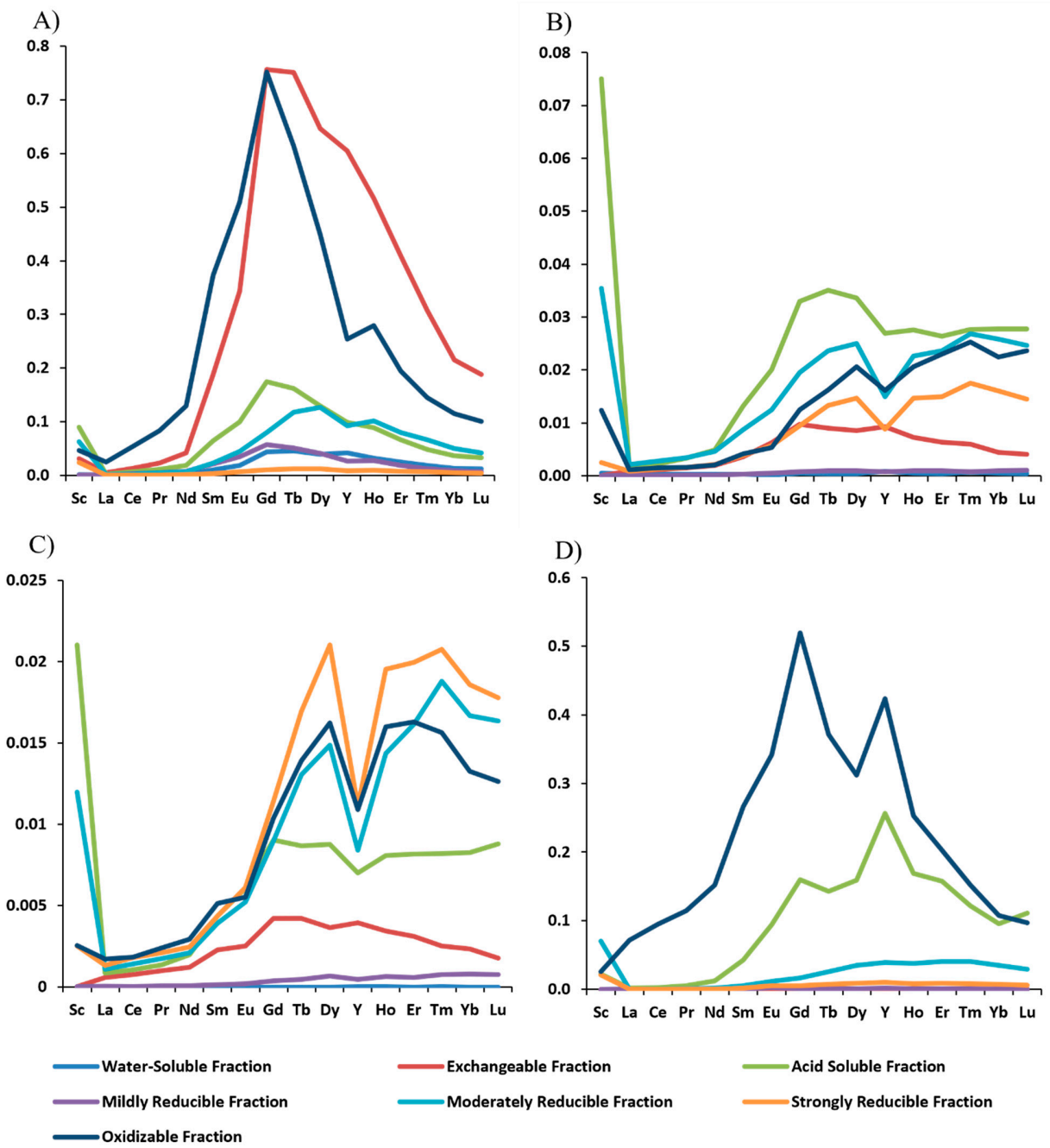

Figure S1: Distribution of REE concentrations by elemental weight normalized to upper continental crust concentrations in four coal-related samples. Note that the range of values on the y-axis change from graph to graph. (**A**) WV MKT underclay. (**B**) WV MKT coarse coal refuse. (**C**) Central PA LKT underclay. (**D**) Central PA MKT underclay.

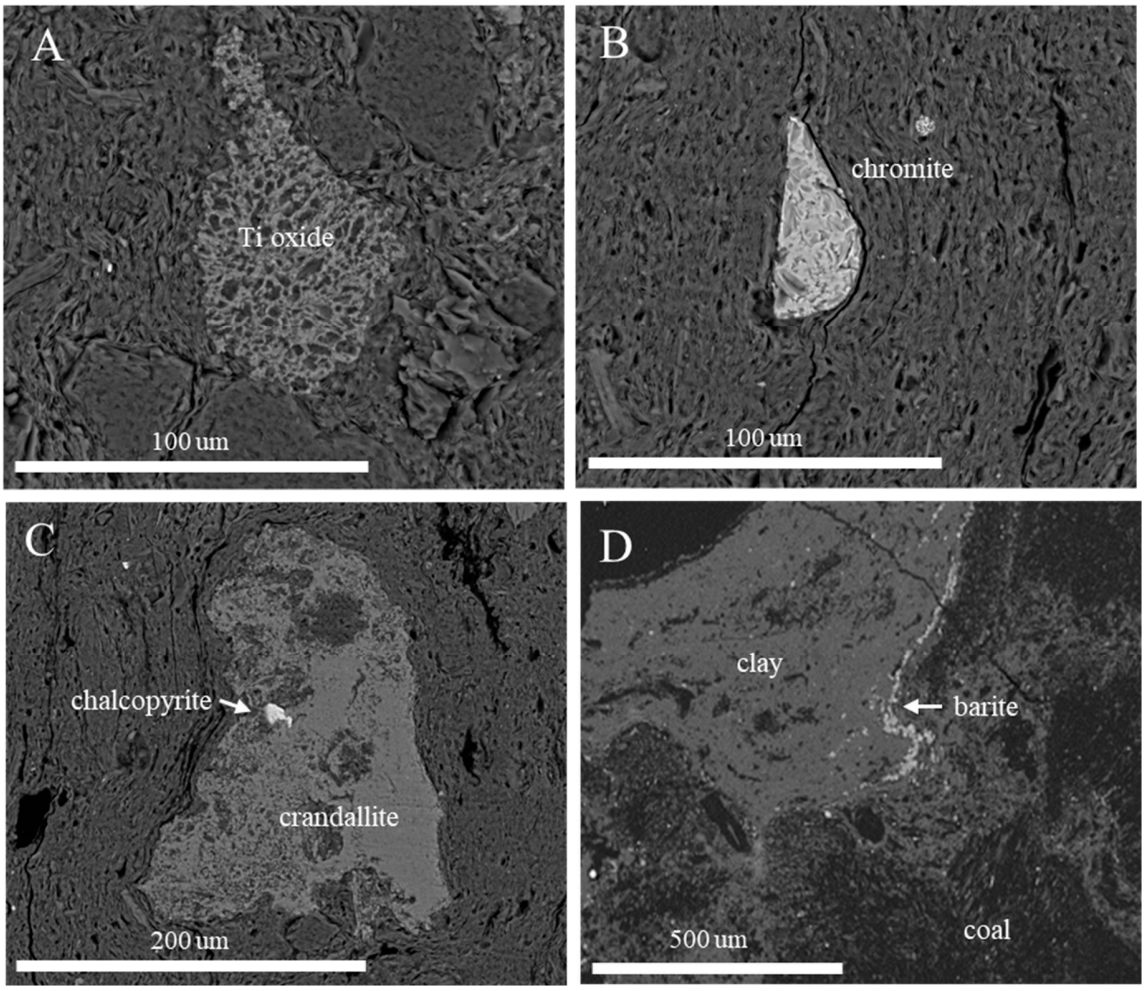

Figure S2: WV MKT coarse coal refuse: (**A**) Ti-oxide, (**B**) Chromite and (**C**) Chalcopyrite and crandallite embedded in clay matrix, (**D**) Barite embedded between coal and clay boundary (central PA MKT underclay).