

Table S1. Electron-microprobe data (in wt.%) for coffinitized uraninite (cofu) and coffinite from the synchysite-bearing vein in the Rožná uranium deposit.

Analysis No.	Mineral	SiO ₂	Al ₂ O ₃	TiO ₂	ZrO ₂	UO ₂	PbO	CaO	FeO	MnO	P ₂ O ₅	F
59464	cofu	8.11	1.17	0.28	2.55	76.1	2.32	3.86	1.07	0.66	b.d.l.	b.d.l.
59464	cofu	11.2	1.54	0.39	2.70	75.6	0.56	3.79	0.89	0.42	b.d.l.	b.d.l.
59464	cofu	11.8	1.94	0.50	2.10	75.1	0.47	3.56	0.77	0.49	b.d.l.	b.d.l.
59464	cofu	13.1	2.11	0.288	2.80	53.9	0.21	16.4	0.57	0.22	b.d.l.	b.d.l.
59464	cofu	7.9	1.29	0.11	0.95	79.6	1.97	3.82	0.92	0.62	b.d.l.	b.d.l.
59464	cofu	12.2	1.88	0.17	1.34	76.4	0.31	3.39	0.84	0.44	b.d.l.	b.d.l.
59464	cofu	12.5	2.16	0.29	2.26	74.9	0.477	3.35	0.69	0.34	b.d.l.	b.d.l.
59464	cofu	8.48	1.38	0.43	2.59	78.2	1.31	3.73	1.02	0.66	b.d.l.	b.d.l.
59496	cofu	7.85	0.68	0.10	0.19	80.5	2.02	2.21	0.59	0.36	0.65	0.10
59496	cofu	8.09	1.11	0.29	1.041	79.1	1.83	2.94	0.78	0.56	0.14	b.d.l.
59496	coffinite	8.34	1.13	0.29	0.88	80.1	1.67	2.70	0.82	0.61	0.18	b.d.l.
59496	coffinite	17.5	3.028	1.00	1.93	67.1	2.01	2.45	1.08	0.156	0.45	b.d.l.
59496	cofu	21.7	3.93	0.26	1.57	63.4	b.d.l.	1.306	1.16	b.d.l.	0.67	b.d.l.
59496	cofu	9.55	1.11	0.153	0.82	77.2	b.d.l.	2.34	0.63	0.51	0.10	b.d.l.
59465	coffinite	20.8	3.08	19.2	4.02	36.5	0.43	2.81	1.19	0.16	b.d.l.	b.d.l.
59465	coffinite	22.7	3.44	17.2	3.97	34.9	0.18	2.72	3.24	0.34	b.d.l.	b.d.l.
59455	cofu	13.7	1.25	0.87	2.74	64.1	b.d.l.	1.56	0.39	b.d.l.	0.27	0.29
59455	cofu	15.7	1.45	0.76	4.18	59.6	b.d.l.	1.56	1.36	b.d.l.	0.37	0.24

Analysis No.	Mineral	Ce ₂ O ₃	Nd ₂ O ₃	Sm ₂ O ₃	Gd ₂ O ₃	Dy ₂ O ₃	Y ₂ O ₃	Er ₂ O ₃	Yb ₂ O ₃	Sum
59464	cofu	0.47	b.d.l.	b.d.l.	b.d.l.	0.49	b.d.l.	b.d.l.	b.d.l.	97.0
59464	cofu	0.77	0.13	0.20	b.d.l.	0.15	b.d.l.	b.d.l.	b.d.l.	98.3
59464	cofu	0.58	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	97.3
59464	cofu	0.86	b.d.l.	0.24	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	90.6
59464	cofu	0.48	0.28	0.12	0.16	b.d.l.	b.d.l.	b.d.l.	b.d.l.	98.3
59464	cofu	0.99	0.31	0.21	0.44	0.14	b.d.l.	b.d.l.	b.d.l.	99.0
59464	cofu	0.29	0.16	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	97.4
59464	cofu	0.32	b.d.l.	b.d.l.	b.d.l.	0.29	b.d.l.	b.d.l.	b.d.l.	98.4
59496	cofu	b.d.l.	b.d.l.	0.18	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	95.5
59496	cofu	0.15	b.d.l.	0.19	b.d.l.	0.29	b.d.l.	0.26	b.d.l.	96.8

59496	coffinite	0.42	b.d.l.	b.d.l.	b.d.l.	b.d.l.	0.29	b.d.l.	0.29	97.4
59496	coffinite	0.21	0.15	b.d.l.	b.d.l.	0.14	b.d.l.	b.d.l.	b.d.l.	97.2
59496	cofu	0.57	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	94.5
59496	cofu	0.38	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	92.9
59465	coffinite	1.41	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	89.7
59465	coffinite	1.43	b.d.l.	b.d.l.	0.19	b.d.l.	b.d.l.	0.12	b.d.l.	90.7
59455	cofu	0.614	0.25	b.d.l.	b.d.l.	b.d.l.	b.d.l.	0.11	b.d.l.	86.244
59455	cofu	0.71	0.16	b.d.l.	b.d.l.	b.d.l.	0.12	b.d.l.	0.12	86.50

b.d.l.: Below detection limit.

Table S2. Chemical composition of titanite in host rocks of the synchisite-bearing vein in the Rožná uranium deposit. Concentrations of oxides and F in wt.%, EMPU.

Sample No.	HT1	HT2	HT3	HT4	HT5	HT6	HT7
Oxides							
SiO ₂	30.442	30.412	30.151	30.285	30.305	29.988	30.496
Al ₂ O ₃	1.66	1.919	1.444	1.469	1.54	2.539	1.737
TiO ₂	37.058	36.511	36.586	37.159	37.005	35.057	36.697
CaO	28.132	28.14	27.699	28.069	28.074	26.176	28.515
FeO	0.147	0.203	0.214	0.191	0.209	0.098	0.113
MnO	0.141	0.15	0.139	0.144	0.142	0.18	0.108
F	0.414	0.466	0.353	0.368	0.396	0.432	0.493
Nd ₂ O ₃	b.d.l.	b.d.l.	0.175	0.123	0.12	b.d.l.	b.d.l.
Ce ₂ O ₃	0.176	0.179	0.357	0.324	0.232	0.152	0.165
Y ₂ O ₃	0.112	0.121	0.258	0.182	0.177	2.639	0.136
Nb ₂ O ₅	0.093	b.d.l.	0.049	b.d.l.	b.d.l.	b.d.l.	b.d.l.
Gd ₂ O ₃	b.d.l.	b.d.l.	b.d.l.	b.d.l.	0.129	0.282	b.d.l.
Dy ₂ O ₃	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	0.461	b.d.l.
V ₂ O ₃	0.277	0.31	0.26	0.289	0.075	0.148	0.194
Sum	98.652	98.411	97.685	98.603	98.404	98.152	98.654
apfu (based on 5O)							
Si	1.011	1.013	1.014	1.009	1.012	1.013	1.014
Al	0.065	0.075	0.057	0.058	0.061	0.101	0.068
Ti	0.926	0.914	0.926	0.931	0.929	0.891	0.917
Ca	1.001	1.004	0.999	1.002	1.004	0.948	1.016

Fe	0.004	0.006	0.006	0.005	0.006	0.003	0.003
Mn	0.004	0.004	0.004	0.004	0.004	0.005	0.003
Nd	b.d.l.	b.d.l.	0.002	0.001	0.001	b.d.l.	b.d.l.
Ce	0.002	0.002	0.004	0.004	0.003	0.002	0.002
Y	0.002	0.002	0.004	0.003	0.003	0.042	0.002
Nb	0.001	b.d.l.	0.001	b.d.l.	b.d.l.	b.d.l.	b.d.l.
Gd	b.d.l.	b.d.l.	b.d.l.	b.d.l.	0.001	0.003	b.d.l.
Dy	b.d.l.	b.d.l.	b.d.l.	b.d.l.	b.d.l.	0.005	b.d.l.
V	0.007	0.008	0.007	0.008	0.002	0.004	0.005
F	0.022	0.025	0.019	0.019	0.021	0.023	0.026
O	4.978	4.975	4.981	4.981	4.979	4.977	4.974

Below detection limit: ZrO₂, ThO₂, UO₂, La₂O₃, Sm₂O₃.

Table S3. Chemical composition of hydrothermal xenotime and monazite (products of titanite alteration). In wt.%, EMPA.

Analysis	64558/ 3	64558/ 4	64558/ 4	64558/4	64558/3
Mineral	Xenotime	Xenotime	Monazite	Monazite	Monazite
MgO	1.76	b.d.l.	b.d.l.	2.71	b.d.l.
Al ₂ O ₃	b.d.l.	b.d.l.	0.9	2.12	5.31
SiO ₂	3.23	b.d.l.	22.33	2.82	7.16
P ₂ O ₅	30.1	35.07	25.17	27.43	24.2
K ₂ O	b.d.l.	b.d.l.	b.d.l.	0.36	0.59
CaO	5.59	0.66	1.84	5.49	2.14
TiO ₂	1.03	2.36	b.d.l.	b.d.l.	5.52
Y ₂ O ₃	41.99	46.9	b.d.l.	b.d.l.	b.d.l.
La ₂ O ₃	b.d.l.	b.d.l.	11	6.08	9.7
Ce ₂ O ₃	b.d.l.	b.d.l.	25.62	24.3	24.38
Pr ₂ O ₃	b.d.l.	b.d.l.	b.d.l.	4.13	2.71
Nd ₂ O ₃	b.d.l.	b.d.l.	13.15	17.1	13.47
Sm ₂ O ₃	b.d.l.	b.d.l.	b.d.l.	3.7	2.76
Gd ₂ O ₃	2.44	3.1	b.d.l.	1.95	1.41
Dy ₂ O ₃	4.84	4.39	b.d.l.	b.d.l.	b.d.l.
Er ₂ O ₃	3.1	3.99	b.d.l.	b.d.l.	b.d.l.
Yb ₂ O ₃	3.72	2.4	b.d.l.	b.d.l.	b.d.l.
U ₂ O ₄	2.2	1.13	b.d.l.	b.d.l.	b.d.l.

Suma	100	100	100.01	99.42	99.35
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b.d.l.: below detection limit.

Table S4. Isotope composition of oxygen and carbon in calcites I (older generation) and calcite II (younger generation) from the synchysite-bearing, post-uranium, quartz-carbonate-sulfide vein in Rožná and recalculated isotopic composition of oxygen and carbon of fluid.

Sample	Mineral	$\delta^{13}\text{C}$	$\delta^{18}\text{O}$	$\delta^{13}\text{C}_{\text{fluid}}$	$\delta^{18}\text{O}_{\text{fluid}}$
		(‰ V-PDB)	(‰ V-SMOW)	(‰ V-PDB)	(‰ V-SMOW)
25-1	Calcite I	-5.2	15.6	-6.2	-4.5
25-2	Calcite I	-5.13	14.76	-6.13	-5.34
158-4-1	Calcite I	-4.74	15.26	-5.74	-4.84
158-4-2	Calcite I	-4.75	15.25	-5.75	-4.85
158-5	Calcite I	-4.72	15.83	-5.72	-4.27
158-7B	Calcite I	-5.04	17.36	-6.04	-2.74
158-6	Calcite I	-5.02	17.56	-6.02	-2.54
26-1	Calcite II	-4.65	18.22	-5.65	-1.88
158-8	Calcite II	-4.89	17.96	-5.89	-2.14
158-9	Calcite II	-5.16	17.3	-6.16	-2.8