



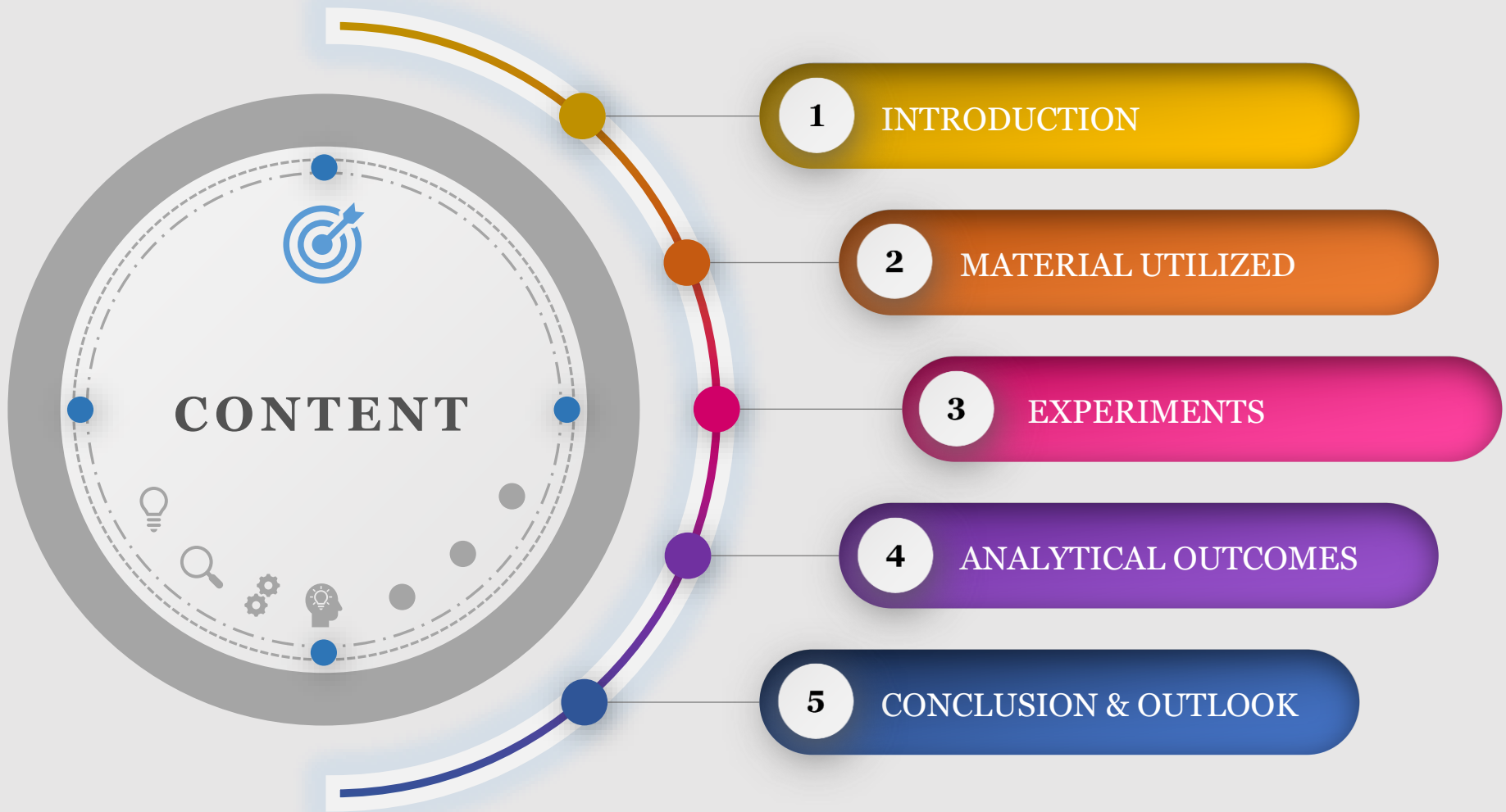
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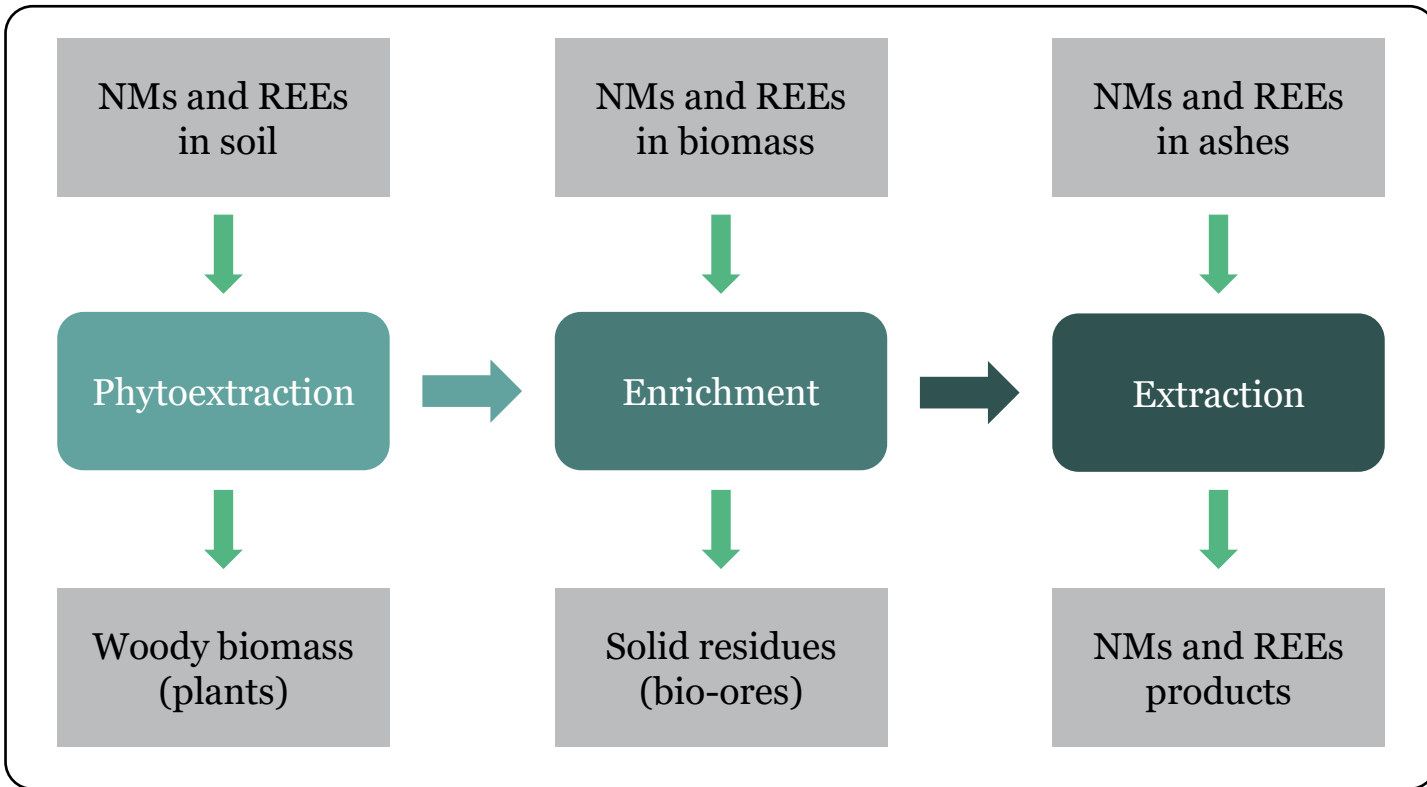
Ostrava, September 7–9, 2026

**Prospects for Reclaiming Valuable
Metals from Biomass-
Derived Ashes**

Dinh Phi Truong
PhD



INTRODUCTION



- ❖ **Study:** Prospects for Reclaiming Valuable Metals from Biomass-Derived Ashes
- ❖ **Goals:** Investigate the enrichment of valuable metals such as noble metals (NMs) and rare earth elements (REEs) by combustion and ash leaching techniques utilizing pelletized woody biomass used as fuel, while describing the behavior and depicting the formation of high-value metals in the combustion system is supported by ICP and SEM methodologies.

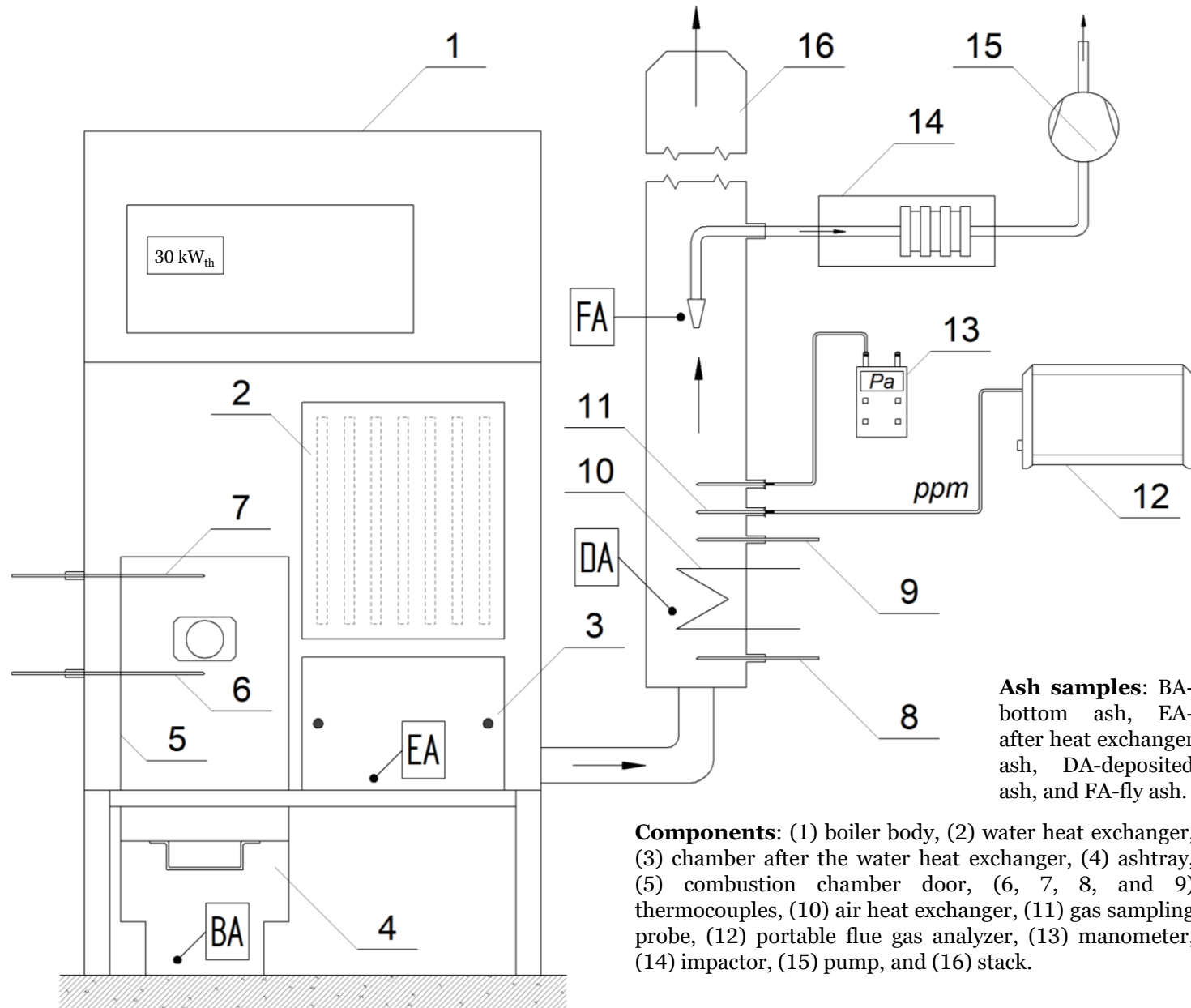
SAMPLING LOCATION



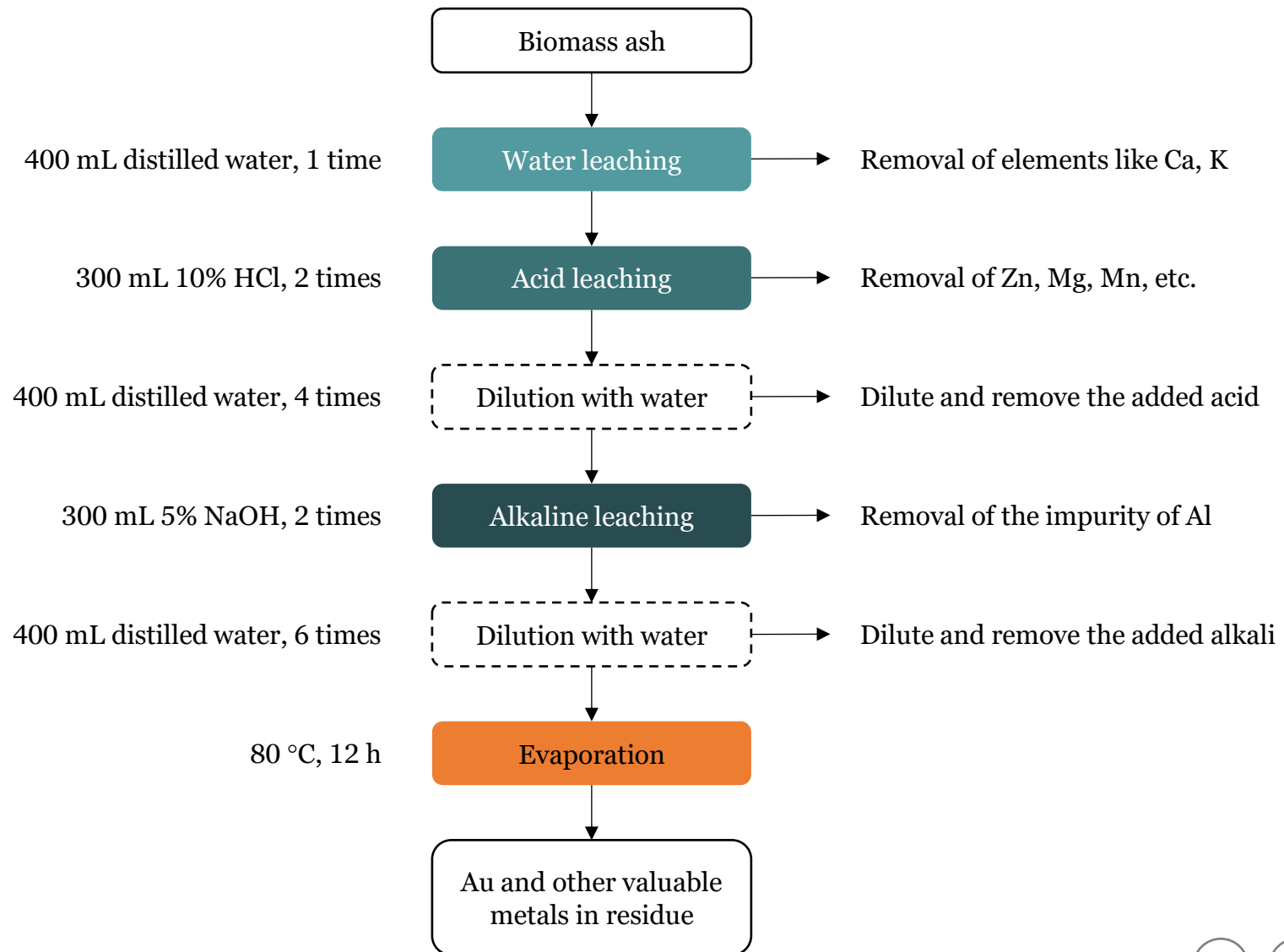
BIOMASS SAMPLING



EXPERIMENTAL SYSTEM



LEACHING PROCEDURE



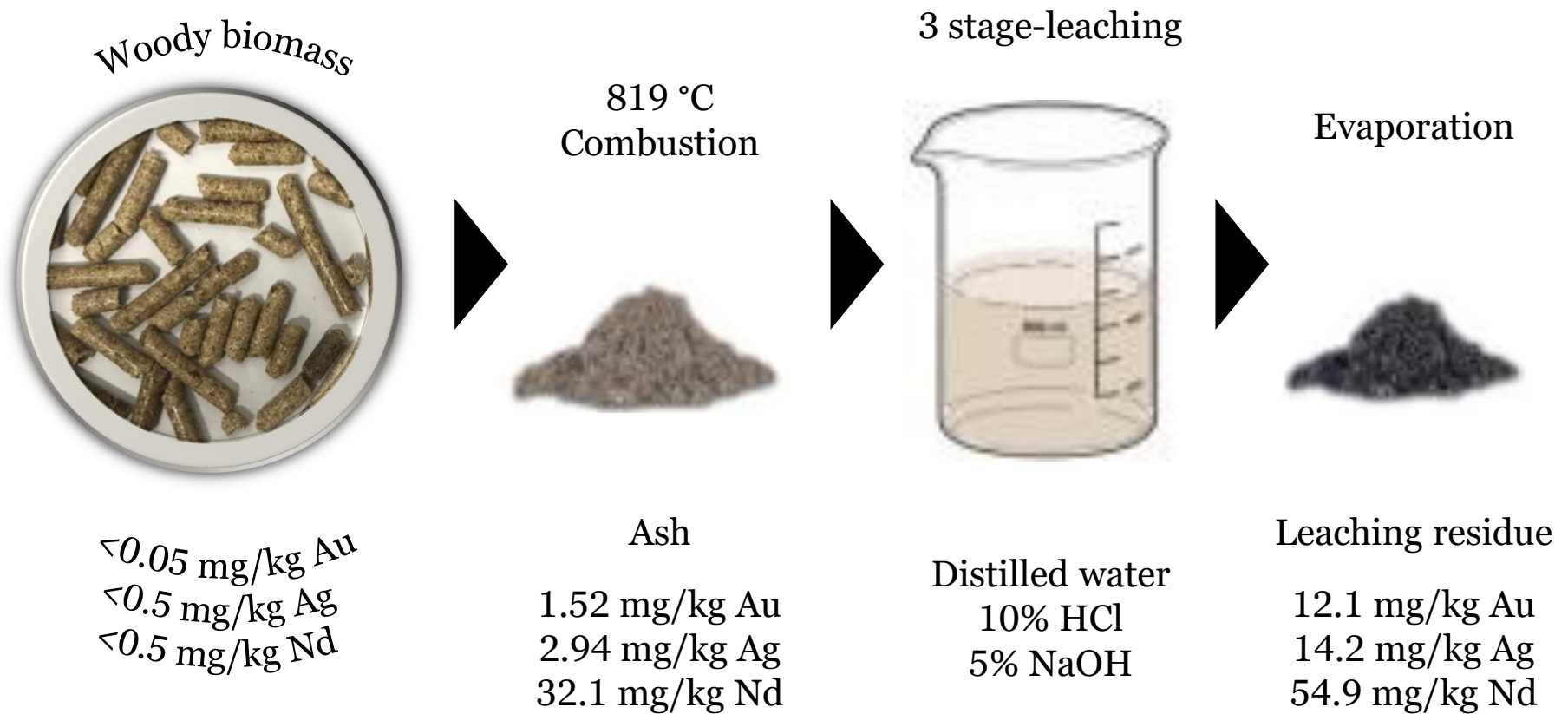
ICP ANALYSIS

Concentrations of NMs and REEs in solid samples (mg/kg)

Metal	Biomass	Biomass combustion ashes				Leaching residues		
	WB	BA	EA	DA	FA	LB	LE	LD
Ag	<0.5	2.94	8.32	17.13	18.87	14.2	21.5	13.1
Au	<0.05	1.52	1.99	2.64	3.52	12.1	<4	12.6
Ce	0.526	5.85	4.08	2.40	<1.5	3.01	2.36	<5
Dy	<1	2.27	1.61	<1	<3	<4	<4	<10
Gd	0.026	7.02	4.30	2.49	<1.5	<2	<2	<5
La	<0.25	4.76	2.99	1.69	<1	1.89	1.02	<3
Nd	<0.5	32.10	19.43	8.01	<3	54.9	20	11.7
Sc	<0.01	0.35	0.38	<0.25	<1	<1	<1	<3
Sm	0.026	3.83	2.16	0.79	<1.5	<2	<2	<5
Y	<0.25	2.87	1.95	1.13	<1	1.05	0.404	<1

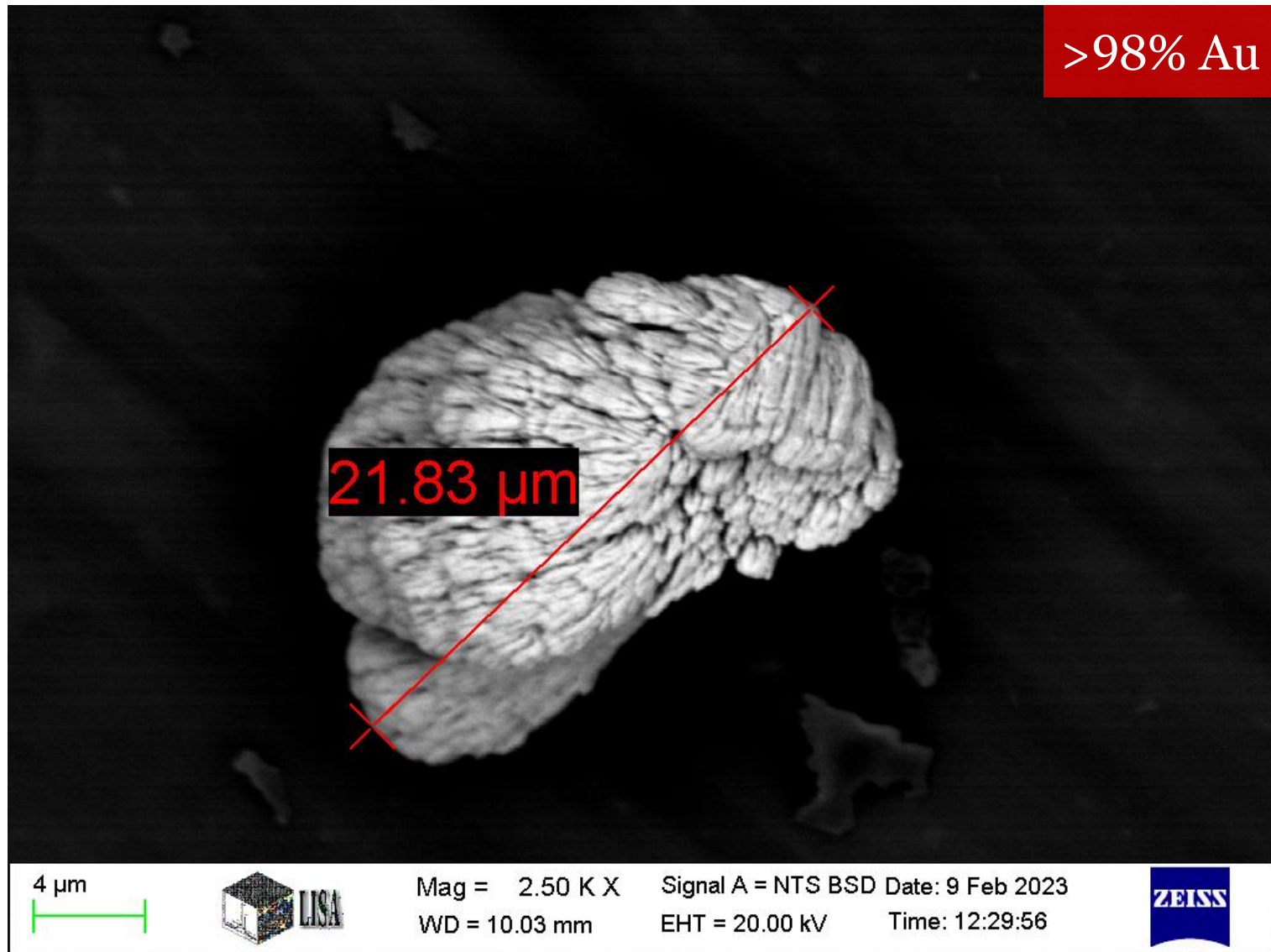
"<": Below the detection limit; WB: Woody biomass; BA, EA, DA, and FA: Bottom ash, after heat exchanger ash, deposited ash, and fly ash, respectively; LB, LE, and LD: leaching residues derived from leaching of bottom ash, after heat exchanger ash, and deposited ash, respectively.

ICP ANALYSIS

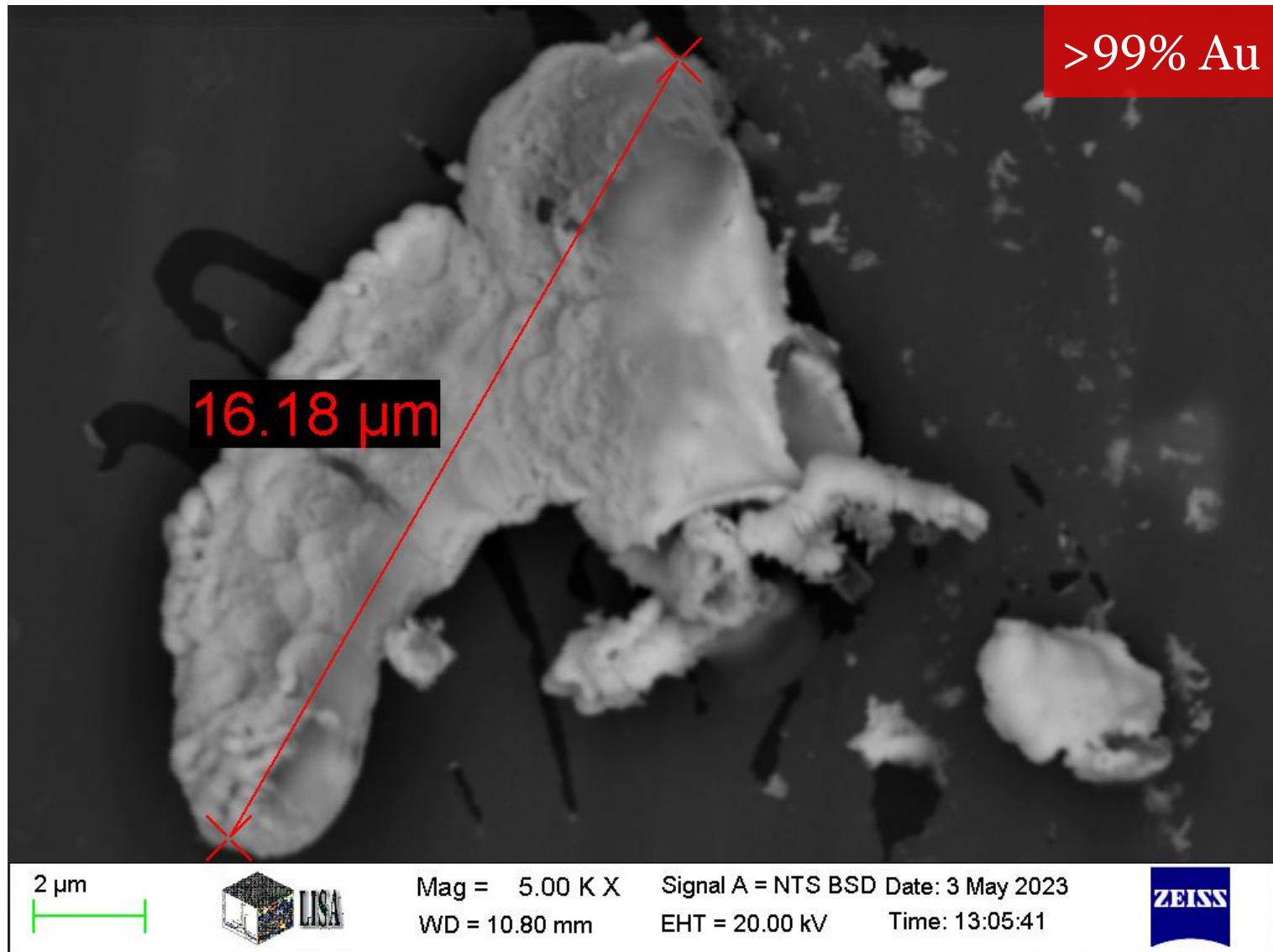


Combustion and leaching process significantly enrich the NMs and REEs

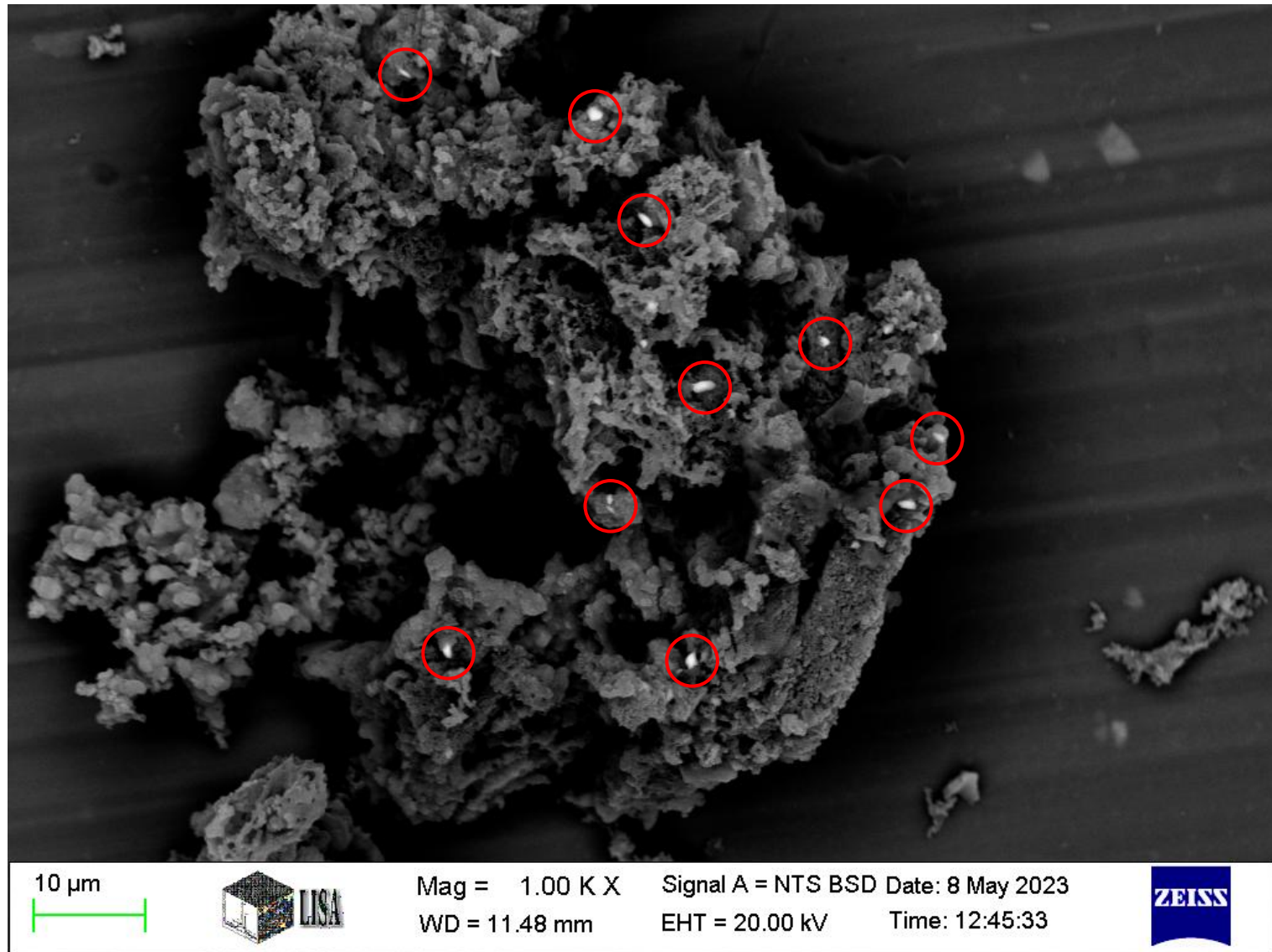
GOLD IN LEACHED BOTTOM ASH



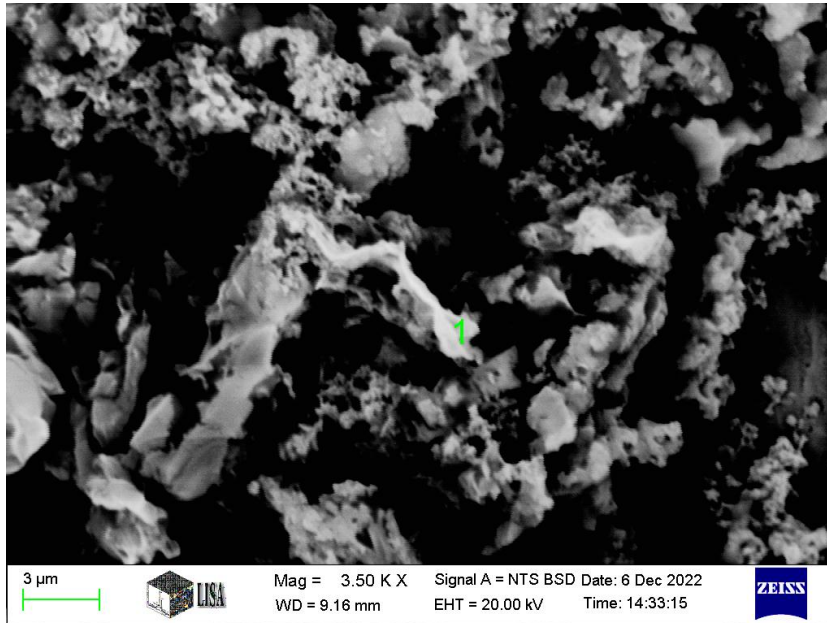
GOLD IN LEACHED BOTTOM ASH



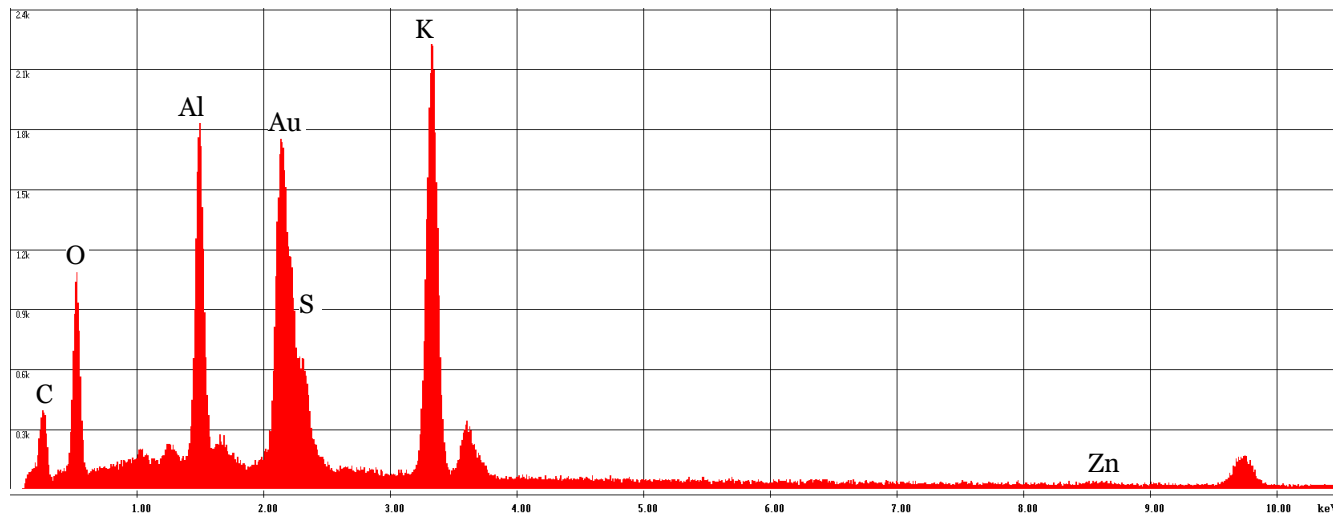
GOLD IN AFTER HEAT EXCHANGER ASH



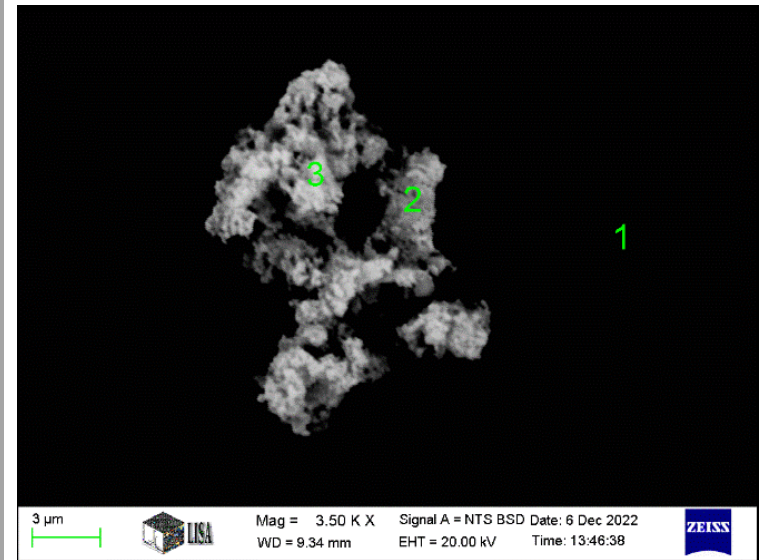
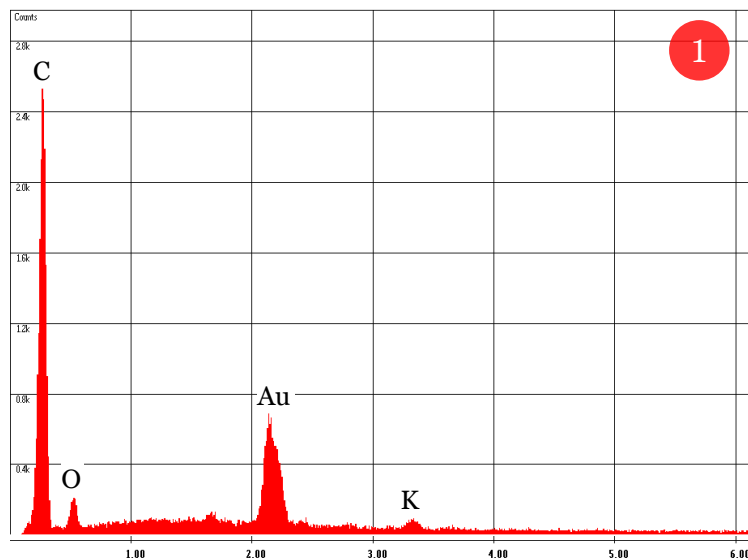
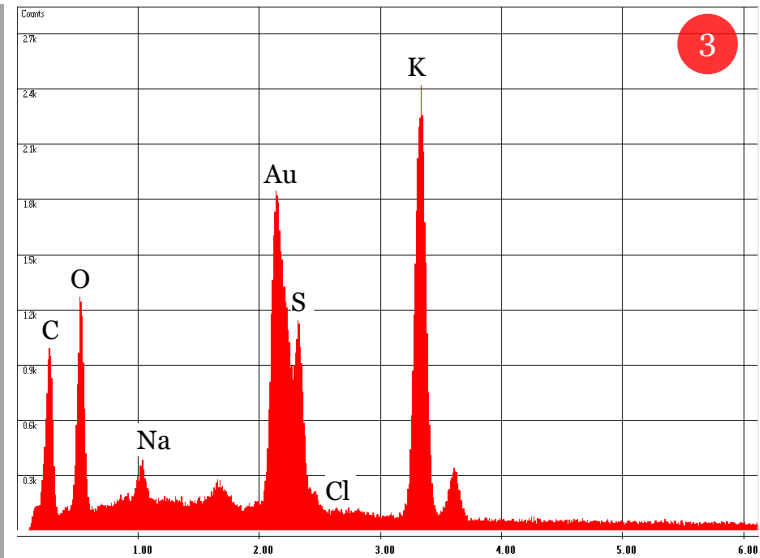
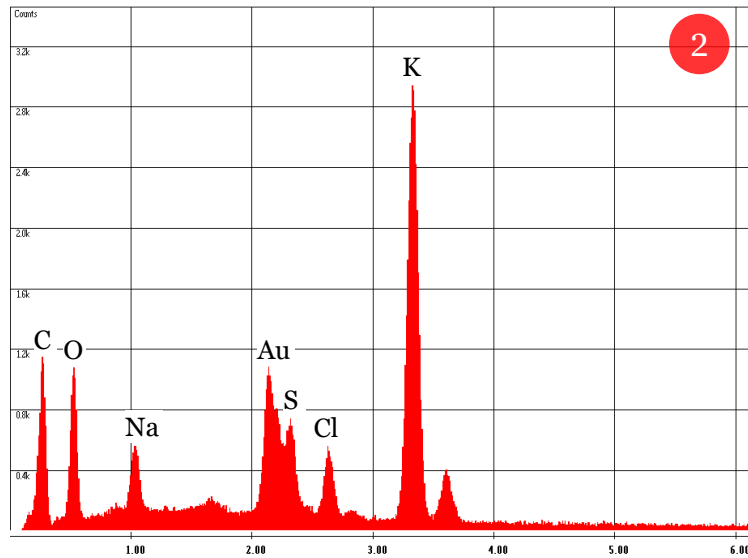
GOLD IN DEPOSITED ASH



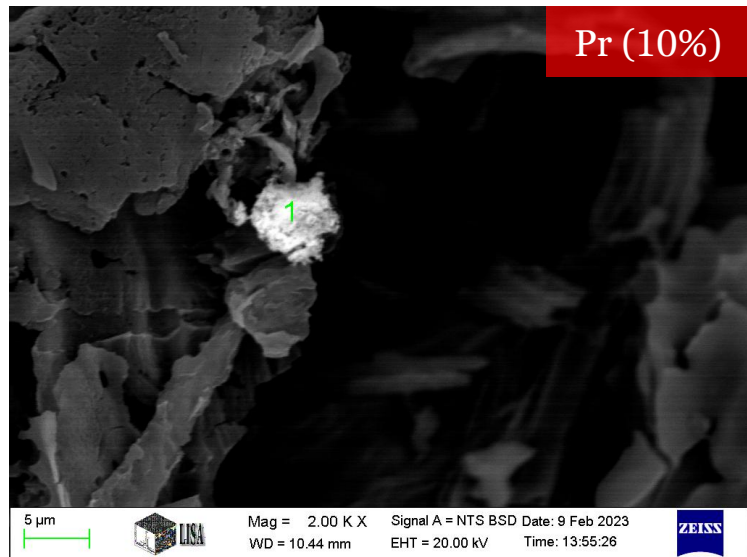
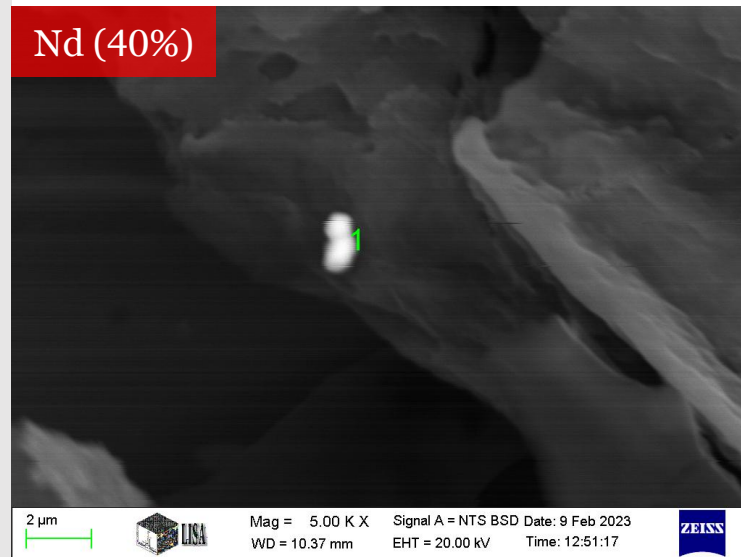
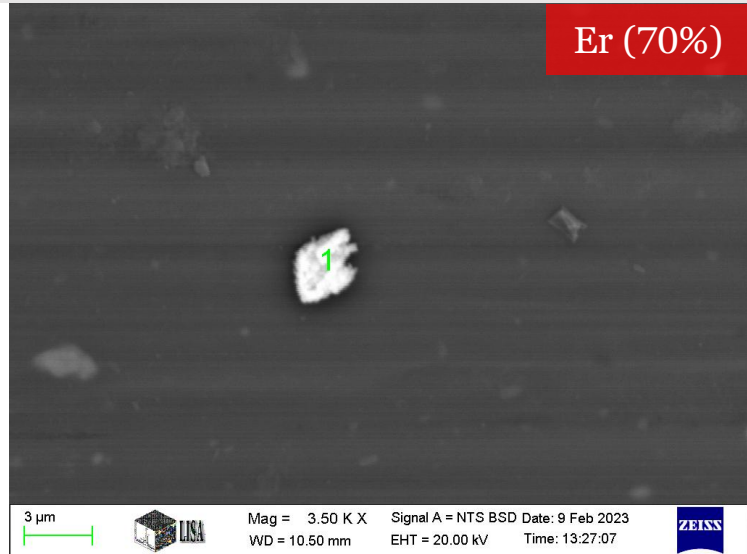
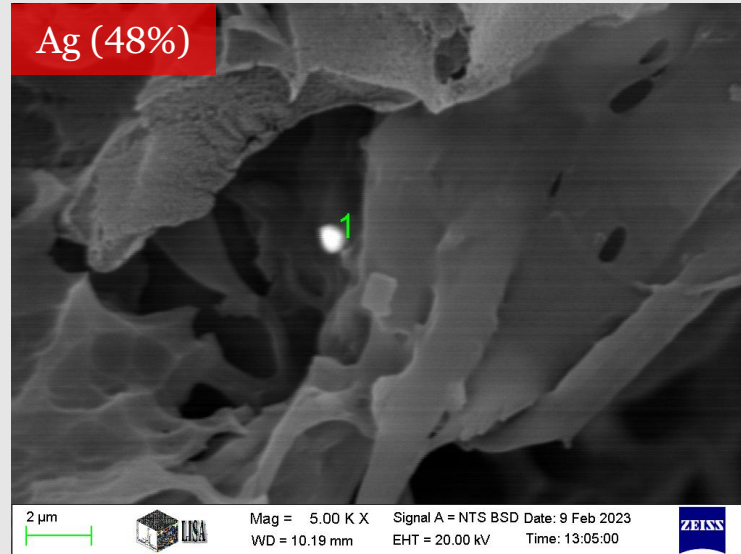
Ele.	Concentration (wt%)
C	7.4
O	20.64
Al	9.38
Au	35.42
S	4.49
K	21.63
Zn	1.04



GOLD IN FLY ASH



OTHER METALS IN LEACHING RESIDUE



Conclusion

Combustion and leaching processes can significantly enrich the NMs and REEs concentration from the woody biomass into the leaching residual. Gold was present as pure particles in bottom ash and heat exchanger ash, but as compounds in fly and deposited ash. The formations of other valuable metals exhibited various patterns.

Conclusion & Outlook

Outlook

Noble metals and rare earth elements will be subsequently extracted and recovered from the leaching residues. The combustion technique and somehow the overall concept of phytoextraction-enrichment-extraction can be applied to other material inputs of contaminated biomass coming from different brownfields.





MISKOLC
EGYETEM
UNIVERSITY OF MISKOLC

THANK YOU



Truong Phi Dinh



truong.dinh@uni-miskolc.hu



**Institute of Energy, Ceramics
and Polymer Technology**



www.energy.uni-miskolc.hu

