



Analysis of Technology-Critical Elements (TCE)

ALS offers analysis of Technology Critical elements by high resolution ICP-MS (ICP-SFMS). The laboratory is equipped to handle any sample matrix such as water, solid material, biota, waste and more. Furthermore, up to 72 elements from the periodic table can be tested quantitatively.

TCEs are typically present at ultra-trace levels in environmental samples, thus setting high demands on performing laboratory. ALS Scandinavia participates in the COST Action TD1407 network as part of a work group focusing on development of analytical procedures for determining TCEs at environmentally relevant levels.

What are Technology Critical Elements (TCE)?

In the development of new technologies, trace metals such as PGE (platinum group elements) and REE (rare earth elements) are key components. Due to a significant usage increase in a number of technologies there is a need to understand their concentrations and transport in the environment. Moreover, the impact of technically-critical elements on biochemical cycles and potential health threats are to be further explored.

A new and relatively scarcely studied group of elements, Technology-Critical Elements or TCEs, has gained considerable interest during the last five years. The emerging interest mainly originates from the dramatic alterations in cycling of these elements in environmentally relevant systems, as well as the newly developed ability to quantitatively determine the TCEs in affected and unaffected systems.

Overview of TCSs

Gallium (Ga)	Palladium (Pd)	Holmium (Ho)
Germanium (Ge)	Platinum (Pt)	Lanthanum (La)
Indium (In)	Rhodium (Rh)	Lutetium (Lu)
Niobium (Nb)	Ruthenium (Rh)	Nedymium (Nd)
Tantalum (Ta)	Cerium (Ce)	Praseodymium (Pr)
Tellurium (Te)	Dysprosium (Dy)	Samarium (Sm)
Thallium (Tl)	Erbium (Er)	Terbium (Tb)
Iridium (Ir)	Europium (Eu)	Yttrium (Y)
Osmium (Os)	Gadolinium (Gd)	Ytterbium (Yb)

Green cells marks Platinum Group Elements (PGE). Blue cells marks Rare Earth Elements (REE).

TCEs as potential tracers of specific activities

The use of TCEs in new and specific technologies provides an opportunity to use these elements as tracers of specific activities. At each stage of their life cycle, these elements can be released into the environment. Below you find examples of technologies where technically critical elements are used:

Element	Use	Element	Use
Ruthenium (Ru)	Electronics	Platinum (Pt)	Catalytic convertors
Rhodium (Rh)	Catalytic convertors	Cerium (Ce)	Lighter flints, catalytic convertors
Palladium (Pd)	Catalytic convertors, catalysts	Praseodymium (Pr)	Aircraft engine alloys
Osmium (Os)	Staining	Neodymium (Nd)	Magnets
Iridium (Ir)	Electronics	Gallium (Ga)	Computer chips, semi-conductors



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