

INTRODUCTION TO THE CHEMISTRY AND GEOCHEMISTRY OF THE ELEMENTS

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A brief overview of the chemistry and geochemistry of each element discussed in this volume is provided (Table 1).

The texts begin with a brief summary of the element's chemistry, including its position in the periodic table, atomic number, atomic mass, main oxidation states, naturally occurring isotopes and abundances, and main chemical associations.

The element's geochemistry is then discussed. Main mineral forms and associations are identified. Data on abundance in the earth's crust and in different rock types are provided. Elements are characterised as:

1. lithophile (rock-loving) – elements with a strong affinity to form oxides, and mainly rock-forming silicates;
2. chalcophile (copper-loving) – elements with a strong affinity to form sulphides;
3. siderophile (iron-loving) – elements with a strong affinity to form metals or solid solutions in metals,
4. biophile or organophile (organic matter loving) – elements that concentrate in living matter, and

5. atmophile (gas-loving): elements that exist either uncombined or as highly volatile compounds.

Controls on the element's behaviour are discussed with particular respect to the geochemistry of the element in the surface environment. Information about the nature of soil solutions, and the global average abundance of each element in soil is given. The basic natural processes contributing to the concentration of the element in stream water are discussed, including (i) acid-base controls, (ii) complexation, (iii) oxidation-reduction, (iv) dissolution/precipitation, and (v) adsorption/partitioning reactions. The chemical forms of the element in the aqueous environment are discussed and typical concentrations of each element in river water are given, wherever available.

Finally, a brief discussion is presented on the uses of each element, potential anthropogenic sources of contamination, the element's biological significance and likely hazards posed to plants, animals and humans.

Acknowledgements

Dr Neil Breward, Dr Chris Johnson and Professor Barry Smith of the British Geological Survey are gratefully acknowledged for permitting their text from a number of publications, including BGS (1999, 2000), Johnson *et al.* (2001) and Sewell (1999), to be used as a basis for the descriptions given for some

of the elements discussed in this report. A further source of information is the Website of the Association of Applied Geochemists (<http://www.appliedgeochemists.org/>). The authors would also like to thank Ms Jennifer Cook for her thorough and incisive review of the draft text.

Table 1. Periodic table of elements showing the elements published for each sample medium in the FOREGS-EuroGeoSurveys Geochemical Baseline Mapping

FOREGS GEOCHEMICAL BASELINE MAPPING																					
Analysed sample media																					
1	2												13	14	15	16	17	18			
H	Li	Be											B	C	N	O	F	Ne			
														DOC/TOC	NO ₃						
	Na	Mg											Al	Si	P	S	Cl	Ar			
															PO ₄	SO ₄					
			3	4	5	6	7	8	9	10	11	12									
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr			
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe			
	Cs	Ba	L A N T A N I D E	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn			
	Fr	Ra	A C T I N I D E S																		
				La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
				Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			

Legend:

- Soil: Brown square
- Water: Light blue square
- Humus: Purple square
- Sediments: Green square