Trace amounts of halogens (Cl, Br and I) in 16 U.S. Geological Survey geochemical reference materials

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Accurate and reliable data of halogen abundance have been rarely reported for terrestrial samples, such as crustal rocks and mantle materials. Since halogens differ in volatility from element to element, their content and relative abundance are highly informative when discussing the petrogenesis of such samples. Among the halogens, iodine is important element in discussion of the geochemical circulation in the earth's surface, oceanic crust, continental crust, and mantle [1]. Simply, the scarcity of reliable data for terrestrial rock samples prevents the geochemical discussion of halogens.

There is a shortage of accurate and reliable data of halogens even for geological reference rocks, as can be witnessed in the data libraries, where only preferable, not certified, values and, for some rocks, no values are listed. This deficit must be largely due to the difficulty in determining trace amounts of halogens within these samples. Recently, we have improved the radiochemical neutron activation analysis (RNAA) procedure for trace amounts of halogens (Cl, Br and I), and demonstrated that our RNAA data for Br and I are more reliable and accurate than the data obtained by inductively coupled plasma mass spectrometry (ICP-MS) coupled with pyrohydrolysis preconcentration [2].

In this study, our RNAA procedure was applied to 16 U.S. Geological Survey (USGS) geochemical reference materials (listed in Table 1), where certified values of halogens have never been reported. We will present reliable data for three halogens in 16 USGS reference materials.

Table 1: USGS geochemical reference materials analyzed in this study.

Sample	Type	Sample	Type
BHVO-2	Basalt	QLO-1a	Quartz Latite
BCR-2		COQ-1	Carbonatite
BIR-1a		CLB-1	Coal
W-2a	Diabase	SDC-1	Mica Schist
AGV-2	Andesite	Nod-P-1	Manganese - nodule
DNC-1a	Dolerite	Nod-A-1	
GSP-2	Granodiorite	SBC-1	Shale rock
DTS-2b	Dunite	SGR-1b	

[1] Deruelle *et al* (1992) *EPSL* **108**, 217–227. [2] Sekimoto & Ebihara (2013) *Anal. Chem.* **85**, 6336-6341.