MEAN ATOMIC WEIGHT OF BRAUNSCHWEIG METEORITE.

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Introduction: Braunschweig meteorite is a typical L6 chondrite, moderately shocked (S4) which fell on April 23rd, 2013 in Germany [1]. Mean atomic weight is important to characterize minerals, rocks, planets, moons and asteroids, and is important to classify meteorites, and to characterize meteorite parent bodies [2-5]. The aim of the paper was to determine and analyze mean atomic weight and mean atomic number of the Braunschweig meteorite.

Results and discussion: Bulk elemental composition of the meteorite [1] has been used to calculate mean atomic weight *Amean* and mean atomic number *Zmean* using following formulas:

$$Amean = \sum wi / \sum(wi/Ai), \quad (1)$$

$$Zmean = \sum wi / \sum(wi/Zi), \quad (2)$$

where *wi*(wt%) is the mass fraction of i*th* element, *Ai* is atomic weight of i*th* element, and *Zi* is atomic number of i*th* element.

Apart from the bulk composition data, also *Fe/Si* ratio, grain density *dgrain*, and magnetic susceptibility χ were used to predict *Amean* values using *Amean(Fe/Si)*, *Amean(dgrain)*, and *Amean(log*χ*)* relationships, recently established by Szurgot (e.g. [2-5]):

$$Amean(Fe/Si) = 5.72 \cdot Fe/Si + 20.25, \quad (3)$$

$$Amean(dgrain) = 7.51 \cdot dgrain - 2.74, \quad (4)$$

$$Amean(log\chi) = 1.49 \cdot log\chi + 16.6, \quad (5)$$

$$A(Fe/Si, dgrain, \chi) = (Amean(Fe/Si) + Amean(dgrain) + Amean(log\chi))/3. \quad (6)$$

Table 1 compiles values of *Amean*, *Zmean* and *Amean/Zmean* ratios calculated for Braunschweig, Sołtmany, and average values for L6 chondrites. Data concern falls, and composition of meteorites does not include H_2O.

Table 1 Mean atomic weight *Amean*, mean atomic number *Zmean*, *Amean/Zmean* ratio, and *Fe/Si* atomic ratio of Braunschweig, Sołtmany and mean for L6 chondrites.*****Sołtmany's and L6's data were established by Szurgot [2].

Meteorite	*Amean (Bulk composition)*	*Zmean*	*Amean/Zmean*	*Fe/Si atomic ratio*
Braunschweig L6	**23.68**	**11.72**	**2.021**	**0.587**
Sołtmany L6	23.97*****	11.85	2.022	0.588*****
L6 Average[#]	24.06 ± 0.16*****	11.89	2.023 ± 0.002	0.60 ± 0.04*****
L6 Range	*23.6 - 24.4*	*11.7-12.1*	*2.021 - 2.027*	*0.53 - 0.65******

Table 2 *Amean* values of Braunschweig determined by bulk composition (eq.(1)), and by relationships (eqs *(3)-(6)).*

Amean (Bulk composition)	*Amean(Fe/Si)*	*Amean(dgrain)*	*Amean(log*χ*)*	*A (Fe/Si, dgrain,* χ*)*
23.68	**23.61**	**23.94***	**23.65***	**23.73** ± 0.18

*Braunschweig *Fe/Si* = 0.587, *dgrain* = 3.553 g/cm^3 [1], and *log*χ = 4.73 [1]. [#] Average for ten L6 chondrites

Tables 1 and 2 show that Braunschweig *Amean* = 23.68 is close to the mean atomic weight of L6 chondrite falls (average: 24.06 ± 0.16, range: 23.6-24.4)**,** and Braunschweig *Fe/Si* atomic ratio (0.587) is close to an average for L6 falls: 0.60 ± 0.04, and is within the L6 range: 0.53 - 0.65 [2]. In addition, Braunschweig *Amean/Zmean* ratio (2.021) is close to Sołtmany *Amean/Zmean* ratio (2.022) and to the average *Amean/Zmean* L6's ratio: 2.023.

Conclusions: Mean atomic weight, mean atomic number, *Amean/Zmean* ratio, and *Fe/Si* ratio indicate that Braunschweig belongs to L6 chondrites, as previously established [1]. *Fe/Si* atomic ratio, grain density, and magnetic susceptibility satisfactorily predict *Amean* values for Braunschweig.

References: [1] Bartoschewitz et al. 2017. *Chemie der Erde – Geochemistry* 77:207-224 [2] Szurgot M. 2015. *Acta Societatis Metheoriticae Polonorum* 6:107-128. [3] Szurgot M. (2015) *LPSC XLVI*, Abstract #1536. [4] Szurgot M. (2016) *LPSC XLVII*, Abstract #2180. [5] Szurgot M. (2017) *LPS XLVIII*, Abstract #1130.