**MEAN ATOMIC WEIGHT OF ORDINARY CHONDRITES. EFFECT OF PETROLOGIC TYPE.**

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**Introduction:** Mean atomic weight of rocks, planets, moons, and asteroids is a property important for studies of extraterrestrial matter [1-6]. The aim of the paper was to determine and analyze mean atomic weight *Amean* of ordinary chondrites and to establish the effect of thermal metamorphism represented by petrologic grade (type).

**Results and discussion:** Literature data on mean bulk elemental and oxide composition of chondrites (e.g. [7]) have been used to calculate mean atomic weight. Table 1 compiles values of *Amean* for meteorite falls. *Amean* data concern LL, L, H, L/LL and H/L chondrites. Data inserted in Table 1 are average *Amean* values for LL, L and H groups, and *Amean* values for individual chondrites of intermediate L/LL and H/L groups.

**Table 1** Mean atomic weight *Amean* of meteorites.

| Petrologic Grade | Group LL | | L/LL[4 ] | | L | | H/L[4] | H | |
|---|---|---|---|---|---|---|---|---|---|
| **3** | 22.66 | *(23.48)** | | *(23.49)* | 23.04 | *(23.83)* | *(24.32)* | 23.88 | *(24.84)* |
| **4** | 23.25 | *(23.39)* | 23.22 | *(23.52)* | 23.13 | *(23.84)* | *(24.25)* | 24.56 | *(25.09)* |
| **5** | 23.15 | *(23.29)* | 23.31 | | 23.55 | *(23.85)* | | 24.77 | *(25.06)* |
| **6** | 23.06 | *(23.30)* | 23.65 | | 23.56 | *(23.84)* | | 24.79 | *(25.06)* |
| **Average[#]** | **23.03** | ***(23.36)*** | **23.39** | ***(23.50)*** | **23.32** | ***(23.84)*** | ***(24.29)*** | **24.50** | ***(25.01)*** |
| **Average[#]** [4] | | ***(22.90)*** | | ***(23.34)*** | | ***(23.67)*** | ***(24.32)*** | | ***(24.63)*** |

*Values shown in parentheses are for meteorite composition without $H_2O$. [#]Averages include all 3-6 grades.

Data reveal that thermal metamorphism affects *Amean*, and the effect of petrologic type on *Amean* is seen best for H group. Relatively unmetamorphosed ordinary chondrites (type 3) have smaller *Amean* values than thermally metamorphosed chondrites (types 4-6). *Amean's* follow the inequalities: *AmeanH3<AmeanH4≈AmeanH5≈AmeanH6*, *AmeanL3<AmeanL4≈AmeanL5≈AmeanL6*, and *AmeanLL3<AmeanLL4≈AmeanLL5≈AmeanLL6*. The presence of $H_2O$ in bulk composition leads to smaller values of *Amean*. Average *Amean's* values for various OC groups presented in the last two rows of Table 1 show that: *AmeanLL<AmeanL/LL<AmeanL<AmeanH/L<AmeanH*. This inequality is important for meteorite classification.

Individual ordinary chondrites reveal *Amean* values: **type 3**: Bishunpur LL3.15: 22.59 (23.49), Inman L/LL3.4: (23.49), Hallingeberg L3.4: 23.05 (24.16), Bremervörde H/L3.9: 24.38, Tieschitz H/L3.6: (24.32), Dhajala H3.8: 25.06 (25.22), **type 4**: Greenwell Springs LL4: 23.25 (23.39), Soko-Banja L4: 23.27 (23.38), Cynthiana L/LL4: 23.15, Albareto L/LL4: 23.30, Bjurböle L/LL4 (23.52)), Saratov L4: 23.56 (23.82), Burnwell H4-an: 24.79 (25.08), and Kabo H4: 25.09 (25.20), **type 5**: Hautes Fagnes LL5: 23.11, Knyahinya L/LL5: 23.24, Mirzapur L5: 23.48 (23.64), Baszkówka L5: 23.11 (23.86), Mount Tazerzait L5: 23.71 (24.49)), Crumlin L5: 23.33 (23.74), Elenovka L5: 23.94 (24.07), Guibga L5: 23.95 (24.08), Ausson L5: 23.96 (24.17), Arapahoe L5: 23.78 (23.90), and Pribram H5: 24.63 (24.83)), **type 6**: Ensisheim LL6: 23.06 (23.32), Sultanpur L/LL6: 23.65 (23.91) [4], Holbrook L/LL6: (23.95), Bruderheim L6: (24.19), Sołtmany L6: (23.97) [1], Berduc L6: (24.06), Villalbeto de la Peña L6: (23.79), Girgenti L6: 23.94 (24.12), L'Aigle L6: 23.67 (24.07), Jesenice L6: (24.37) [1], Devri-Khera L6: (23.91), Ustí nad Orlici L6: (24.36), and Guareña H6: 24.73 (24.92). *Amean(Fe/Si)* dependence [2] leads to *Amean* values: Bishunpur: 23.28, Saratov: 23.54, Ensisheim: 23.16, L'Aigle: 23.83, Greenwell Springs: 23.23, and Guareña: 24.96.

Dark structures representing shock deformed material exhibit higher *Amean* values, and higher *Fe/Si* atomic ratios than light structures. *AmeanDark-AmeanLight* = 0.15 for Chelyabinsk LL5, and 0.15-0.30 for Novato L6; *(Fe/Si)Dark-(Fe/Si)Light* ≈ 0.03 for Chelyabinsk, and 0.03-0.06 for Novato.

**Conclusions:** Mean atomic weight is a useful indicator of chondrite group, sensitive to shock, and helpful for verification of petrologic type of ordinary chondrites. *Fe/Si* atomic ratio satisfactorily predicts *Amean* values.

**References:** [1] Szurgot M. 2015. *Acta Societatis Metheoriticae Polonorum* 6:107-128. [2] Szurgot M. 2015. *Meteoritics & Planetary Science* 50 (S1 Suppl.1):5013.pdf. [3] Szurgot M. 2015. *Meteoritics & Planetary Science* 50 (S1 Suppl.1):5008.pdf. [4] Szurgot M. 2016. Abstract #2180. 47th Lunar & Planetary Science Conference. [5] Szurgot M. 2015. Abstract #1536. 46th Lunar & Planetary Science Conference. [6] Szurgot M. 2015. Abstract #5001. *Comparative Tectonics and Geodynamics*. [7] Jarosewich E. 1990. *Meteoritics* 35:323-337.