ABUNDANCES AND CONDENSATION TEMPERATURES OF THE ELEMENTS. K. Lodders, Planetary Chemistry Lab. Dept. of Earth & Planetary Sciences, Washington University, Campus Box 1169, St. Louis, MO, USA.

In the past years many new determinations of elemental abundances in the solar photosphere and CI carbonaceous chondrites have become available. I used these results to assemble new abundance tables of the elements for the photosphere and the solar system. I computed self-consistent condensation temperatures for all elements using the new abundances [1].

Recent results from standard solar models and helioseismology show that helium and heavy elements settled from the photosphere which means that current photospheric abundances are not equal to solar system abundances (i.e., proto-solar at 4.55 Ga ago). Therefore we have to consider two elemental abundance sets (photospheric and proto-solar). However, when elemental abundances are normalized to the cosmochemical scale of Si=1e6 atoms, only the H and He abundances differ in both abundance sets.

The major changes in photospheric abundances for C, N, O, and noble gases [summarized in 1] decrease the mass fractions of heavy elements (Z) also altering the hydrogen (X) and helium (Y) mass fractions. The photosphere has X=0.7491, Y=0.2377, Z=0.0133, and proto-solar mass fractions are X_o=0.7110, Y_o=0.2741, Z_o=0.0149. The decrease in C, N, and O abundances leads to a photospheric Z/X=0.0177, significantly lower than previous values ranging from 0.0270 to 0.0208 which are steadily revised downward since 1984. In contrast, the proto-solar Z_o/X_o is 0.0210, which shows that only about 84% of the heavy elements now remain in the photosphere.

The difference in heavy element content increases the condensation temperatures by about 10 K for a solar-system composition gas by comparison to the photospheric composition. The changes in C, N, and O abundances introduce significant changes in the C/O ratio, the amount of oxygen removed by rocky condensates, and in the mass distribution of rocky and icy condensates. The C/O ratio for the new abundances is 0.50 and about 23% of total oxygen condenses into rock, which increases the C/O ratio to 0.65. For comparison, the composition in [2] gives C/O = 0.42, and only about 15% of total O condenses, causing a modest increase in C/O to 0.50. The new abundances result in water ice/rock ratios of 1.17, just half of the water ice/rock = 2.09 from [2]. This reduction in the ice/rock ratio should have important consequences for aqueous alteration processes on meteorite parent bodies and for the chemistry of the outer solar nebula and comets.

A summary of the recommended solar system abundances and condensation temperatures will be given at the meeting and on our web page at http://solarsystem.wustl.edu

References: [1] Lodders, K. (2003) *Astroph. J.* 591 (July). [2] Anders, E. and Grevesse, N. (1989) *Geochim. Cosmochim. Acta* 53, 197-214.

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