AA 19
GEOCHEMISTRY OF CHAINPUR CHONDRULES

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A suite of 20 chondrules from the Chainpur LL3 chondrite has been studied by INAA and electron microprobe. From their chemical and mineralogical composition several conclusions concerning their formation can be drawn:

(a) The silicate fraction of the chondrules was apparently derived from two parent lithologies: K-poor (0.4xCI) and K-rich (2.0xCI), both of which are slightly enriched in Na (1.1-1.4xCI). Rb and Cs follow a similar trend as K. Chondrules were formed by remelting these parent lithologies with and without mixing. Total mixing was achieved in large events, which produced chondrules of chondritic to highly refractory silicate compositions.

(b) Refractory silicates in the chondrules show highly correlated depletion of Na and K. A clear evidence for extensive vapour fractionation.

(c) Siderophile element ratios show that the metallic fraction of the chondrules can roughly be divided into two groups: One, which is generally depleted in Au and enriched in Ni. This type is dominant at absolute Ni concentrations of more than 2.5 mg/g. At lower Ni (i.e. metal) contents the metals are even more fractionated (0.1-10xCI for Au/Ir and Ni/Ir), but Au and Ni are positively correlated. The first type seems to present shock melts of similar composition, which are envisaged for the formation of IAB and IIICD irons (1). The second type is probably derived from evaporation and recondensation processes.

(1)Wasson, J.T. et al. (1980), Z.Naturforsch. 35a, 781-795.

AA 20
THE DYNAMIC STRENGTH OF ICY MEDIA: GEOPHYSICAL AND PLANETOLOGICAL IMPLICATIONS

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The strength properties (i.e. compressive-, tensile-, and crushing strength) of most crystaline solids depend critically on the mode and rate of stress loading. Differences of up to one order of magnitude have been observed for strength values obtained in quasi-static versus dynamic measurements. Knowledge of dynamic strength values is important for a variety of practical as well as theoretical applications.

Data on the dynamic strength properties of ice and icy media (e.g. ice-salt- or ice-silicate mixtures) are scarce. However, due to an increasing effort to use and exploit the polar regions of the Earth as well as due to problems regarding the origin and evolution of the icy satellites of Jupiter and Saturn, a basic knowledge of major mechanical characteristics of icy materials is required.

We performed shock wave experiments aimed to determine the dynamic tensile strength of ice-silicate mixtures with 5 to 30 wt % silicate sand. In these experiments, plexiglas flyer plates are fired against the icy samples (diameter = 20 mm, thickness = 6 mm). The shock waves in flyer and sample are reflected as rarefaction or tensile waves which carry the sample into tension at strain rates of~2×10^4 sec^{-1}. The damage done by the stress loading can be observed on the recovered samples and stresses causing incipient or complete spalling are interpreted to exceed the dynamic tensile strength of the sample. Systematic variations of the projectile velocity allows specification of stress levels corresponding to the dynamic tensile strength of each substance. The strength values found are 17, 20 and 22 MPa for ice and ice-silicate mixtures with 5 and 30 wt%, respectively. These values are 10-12 times those found in quasi-static tests.

Major implications for a variety of geophysical/glaciological problems and planetological implications for icy planetary bodies will be

AA 21
FLUID INCLUSIONS IN QUARTZ ASSOCIATED WITH THE SILJAN ASTROBLEME, SWEDEN

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The Siljan structure represents a deep erosion level of an astrobleme. A center of mainly Proterozoic granites is surrounded by a ring of paleozoic rocks. The relation between rock types and structures is complicated because of (1) post-impact slumping of large blocks of the rocks forming the initial crater walls. (2) Bad exposure of rocks in the district.

Post-impact formation of minerals as various types of vein fillings are common. Non-shocked milky quartz from a large vein revealed fluid inclusions of three types (1) one-phase,< 1 to 10 cm regular shaped inclusions (2) two-phased regular shaped inclusions, 2 to 7 cm (3) larger irregular two-phase inclusions 6-20 cm. The one-phase inclusions dominate, density of inclusion occurrence is estimated at $46 \cdot 10^4$ inclusions per cm^2. Melting temperatures indicate a total salinity of 1.0 eq. wt. % NaCl. Homogenization temperatures range between 146.7°C and 309.4°C. The fluid inclusion data imply formation of the quartz from deep circulated meteoric waters at successively cooling temperatures initially over 300°C.

AA 22
U-Pb CHRONOLOGY IN ACHONDRITES

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Most of the lead isotopic compositions measured in eucrite fragments define a line in the lead-lead diagram which corresponds to an age of 4.545 ± 0.034 Ga and which allows the possibility of a common initial lead similar to the primordial lead. However the age uncertainty reflects a significant scatter in the data and some objects (Stannern, Bereba, Serra de Mage) show model ages distinctly lower than 4.50 Ga.

Internal U-Th-Pb systematics of some of these eucrites indicates the presence of two lead components:

- a radiogenic component which has been formed in situ since 4.54 Ga (Juvinas) or since around 4 Ga (Stannern, Bereba, Serra de Mage),
- a non-radiogenic component which is distinct for each object and with model ages ranging from 3.1 to 1.8 Ga; it can be looked neither as initial lead nor as a product of internal reequilibration. We interpret this component as mobilized lead produced by impacts on the parent body surface (free of primordial lead), probably by undepleted chondritic projectiles. In that sense, its isotopic composition seems compatible with the physics of planetary impacts and records the age of these events.

As a whole, internal U-Pb systematics in achondrites is in agreement with the Rb-Sr and K-Ar chronologies and specifies the events which have affected this material. It crystallized at 4.54 Ga without incorporating any lead. It was then affected by bombardment activity in two ways : first, some objects were perturbed directly by impact(s) at about 4 Ga (to be compared with the lunar record); second, all objects have incorporated non radiogenic lead which was mobilized at the parent body(ies) surface during later events.

AA 23
^{40}Ar-^{39}Ar DATING AND THE THERMAL HISTORY OF THE JILIN METEORITE