THERMOPHYSICAL PROPERTIES OF NWA 6255 (L5) CHONDRITE

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Introduction: Differential scanning calorimetry (DSC) is a useful technique for evaluation of thermal properties of matter, i.e. specific heat capacity, temperature and enthalpy of phase transformations, important for characterization of meteoritic minerals [1]. The aim of the study was to determine thermal properties of NWA 6255: specific heat capacity, the enthalpy and temperature of troilite α/β phase transitions, both as a function of distance from meteorite surface.

Methods: Specific heat capacity (*Cp*) and characterization of phase transition of troilite were evaluated by DSC (Q200 TA Instruments). Two specimens of NWA 6255, one of the crust and one of the interior, were examined in the temperature range 223 – 823 K for *Cp* determination. In addition, the phase transition of troilite from: (a) the fusion crust samples, (b) the edge part of the meteorite (1–2 mm below the crust), and (c) the interior (over 10 mm below the fusion crust) was examined in the temperature range 373 – 473 K.

Results: Specific heat capacity of bulk of NWA 6255 was determined to be *Cp* = 668 J/(kg·K) at 300 K and is close to the value characteristic of stony meteorites [2]. *Cp* differs with spatial distribution in the meteorite, giving 602 J/(kg·K) value for the crust – enriched in refractory elements. Two reversible phase transitions in NWA 6255 bulk's troilite were revealed: α/β transition at (422.9±0.5) K, and β/γ transition at ~593 K. Enthalpy change for α/β transition was (1.53±0.04) J/g, thus bulk troilite content in NWA 6255 chondrite was calculated to be (3.6±0.1) wt%. The temperature of the troilite transition and the extent of its endothermal effect remains nearly unchanged though the meteorite bulk except the edge part (c.a. 1–2 mm below the surface) and the crust – considerable reduction of temperature (422.25 K and 414.4±3.52 K for egde and for crust, respectively) and significant enthalpy (0.50 J/g and 0.44±0.06 for egde and for crust, respectively) was observed.

Conclusions: Thermal properties of NWA 6255 chondrite are comparable with thermal properties of ordinary chondrites [1–3]. The data obtained for $T_{\alpha/\beta}$ obtained by DSC are in accord with TL data and the concept of heat gradient in meteoroid envolved during atmospheric passage [4]. DSC is a useful tool which can give us new valuable results in planetary science but more study are needed.

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