The Križevci H6 chondrite and the origin of H chondrites

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Introduction: Just after local midnight on 5th February 2011, a bright bolide was observed by cameras of the Slovenian and Croatian Meteor Networks. A good record of the track was recorded by several cameras from which a prediction of a strewn field just to the east of the town of Križevci in Croatia was made. A group of volunteers from the Croatian Meteor Network searched the likely strewn field and only days after the fall, found one stone of 291g. Photometry of the bolide recorded that it first became visible at a height of approximately 95km with an entry velocity of 18kms^{-1} and entered dark flight at a height of 21.9km at a velocity of 4kms^{-1}. An orbit was determined from the photometry giving a perigee of 0.74AU, eccentricity of 0.5 and very low inclination of 0.5^{o} [1].

Petrology: A thin section of the stone showed numerous irregular metal grains principally of kamacite with taenite inclusions. The lack of visible chondrules, coarse texture silicates, uniform forsterite compositions (Fo=19.3%) and δ^{17}O, δ^{18}O and Δ^{17}O values of 2.755‰, 3.985‰ and 0.683‰ respectively lead to an H6 classification.

Internal Structure: The stone was analyzed by x-ray tomography to determine the size distribution and relationships between the metal grains. More than 165,000 metal grains larger than 30µm were catalogued including 6 of large dimension (>5mm) and their spatial relationship to each other. Very few grains were catalogued in the size range between ~0.5-5mm and the population of large grains were investigated to determine the mechanism for forming this grain size distribution and the large nodules. Previous hypotheses for the formation of large grains have considered the diffusion of metal under metamorphism and/or shock to form large nodules [2] but discounted by [3].

A detailed study of the spatial and size distribution of the metal grains will be discussed to assess formation mechanisms and thermal history of the H6 parent body.

Age: The cosmic ray age of the body will be presented and used with the precise orbit determined from photometry of the bolide to infer the originating asteroid of this H6 chondrite.

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References:

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