

**Trajectory and Analysis of Fireball-Meteorite “2010.02.28 Kosice” from Security Cameras and from Electron Microscopic Examination.** Prof. Dr. I. Kubovics<sup>1</sup>, P. G. Vizi<sup>2</sup>, Zs. Bendő<sup>1</sup>, <sup>1</sup>Department of Petrology and Geochemistry, Eötvös University, (drkubovics@t-online.hu, bendozs@caesar.elte.hu); <sup>2</sup>MTA Wigner FK RMI (former RMKI KFKI) H-1121 BUDAPEST, Konkoly Th. 29-33. vizip@rmki.kfki.hu

**Introduction:** We want to present our investigations about the 2010.02.28. 22:24:44 UTC fireball event which named last Košice Meteorite. We organized our own expeditions to calculate and find the trajectory and pieces of this fireball-meteorite event.

**The Event:** February 28, 2010 was a cloudy evening above Central-Europe and therefore original meteor cameras were turned off. At 22:24:44 UTC a fireball meteor arrived and was recorded by Hungarian security cameras.

**“Meteor finder” security cameras:** In case of original meteorite finder, sky oriented cameras there are available a correct calibration. For the security cameras this pre-calibration was not available, accordingly the post-event calibration is necessary. On the internet became available two free and researchable records. [1] [2] We have one additional reserved video from one of our colleague’s cousin.

**Getting data from security cameras:** We wrote the method in our paper [3] and we demonstrated in oral presentation at Tuesday, June 8, 2010 at „The 33rd Symposium on Antarctic Meteorites” at the NIPR, Tokyo, Japan. Here we put together some significant pictures about analyzing and post processing cameras.



Credit: T. MESZLÉNYI Telki, Hungary



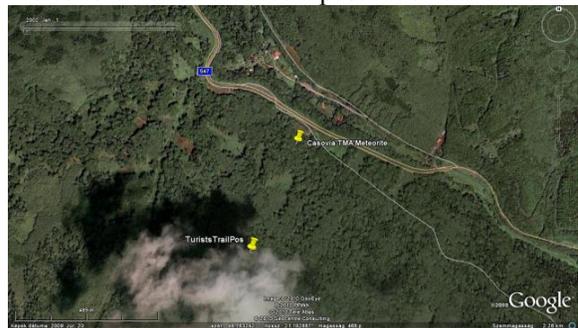
Credit: A. ISTVAN, Budapest, Hungary



The unified video visible on youtube by P.G. Vizi [4]

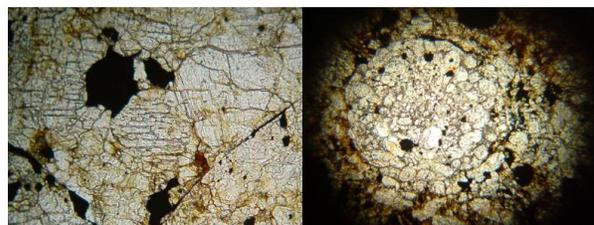


Meteor orbit calculated from post calibrated cameras



Our first visit at the end of the orbit: March 14, 2010.

**The meteorite piece:** During our missions we collected several potential rocks. Fortunately, one of them was a meteorite coming from our investigation.

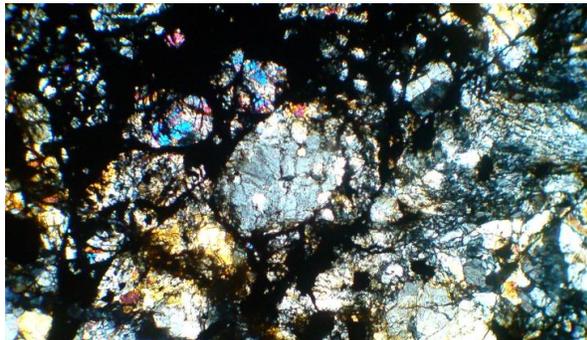


Barred olivine chondrules and porphyritic chondrules

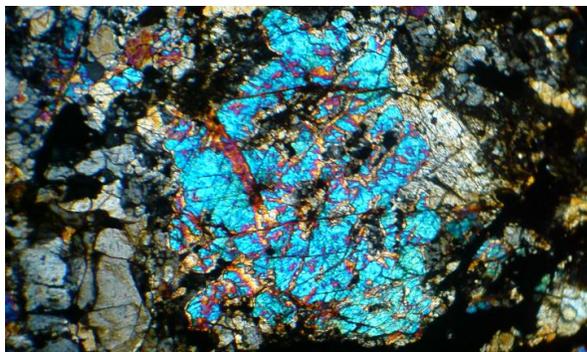
**Analysis:** According the polarized microscopic examination some part of chondrules are totally altered. Many different types of chondrules occur in the meteorite: barred olivine, olivine-pyroxene, porphyritic, granular-porphyritic.

First of all the classification was not too clear because of the state of chondrules, metal content, iron content and other mineral components.

Between chondrules can be found phenocrysts, iron-nickel phases, olivine, pyroxene, feldspar, chlorapatite.



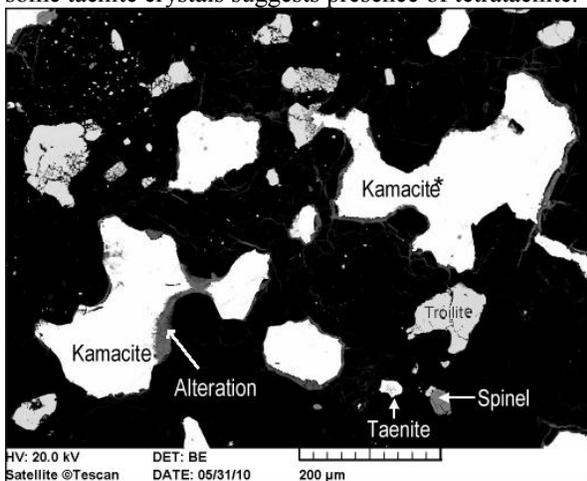
Porphyritic chondrules



Clinopyroxene

**SEM/EDX examination:**

Kamacite - contains 5.2% - 6.9 % nickel; - and taenite - contains 28% - 55% nickel; - abundant amount can be found in the metallic phases. The high Ni content of some taenite crystals suggests presence of tetrataenite.



Alteration visible at the edges of metallic phase.

clinopyroxene	w%	6 oxygens
MgO	16.30	0.87
Al <sub>2</sub> O <sub>3</sub>	1.90	0.08
SiO <sub>2</sub>	56.50	2.03
CaO	19.77	0.76
TiO <sub>2</sub>	0.59	0.02
Cr <sub>2</sub> O <sub>3</sub>	0.94	0.03
FeO	3.99	0.12
TOTAL	100.00	3.90

kamacite	w%	atom%
Fe	93.84	94.12
Ni	6.16	5.88
TOTAL	100.00	

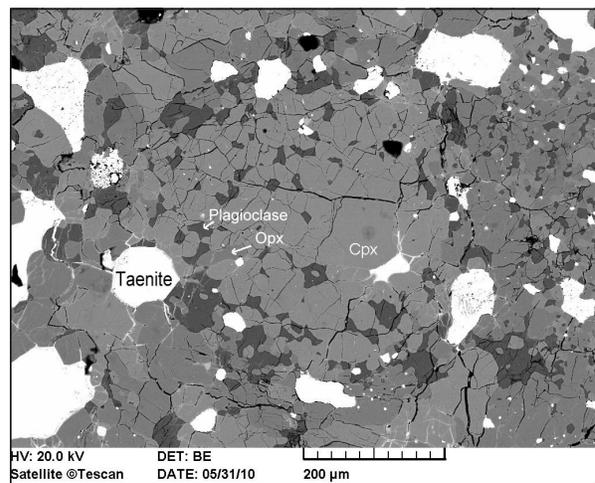
taenite	w%	atom%
Fe	60.17	61.36
Ni	39.83	38.64
TOTAL	100.00	

troilite	w%	atom%
Fe	65.84	52.53
S	34.16	47.47
TOTAL	100.00	

tetrataenite	w%	atom%
Fe	44.81	46.04
Ni	55.19	53.96
TOTAL	100.00	

plagioclase	w%	8 oxygens
Na <sub>2</sub> O	9.21	0.79
Al <sub>2</sub> O <sub>3</sub>	20.88	1.09
SiO <sub>2</sub>	64.95	2.88
CaO	4.04	0.19
K <sub>2</sub> O	0.92	0.05
TOTAL	100.00	5.00

spinel	w%	4 oxygens
MgO	3.37	0.17
Al <sub>2</sub> O <sub>3</sub>	8.48	0.35
TiO <sub>2</sub>	1.59	0.04
Cr <sub>2</sub> O <sub>3</sub>	58.40	1.60
FeO	28.16	0.82
TOTAL	100.00	2.98



**Conclusion:** From the examinations and measurements the Kosice meteorite is approximately H5 type olivine-bronzite chondrite.

**References:** [1] RTL Klub (2010) Meteor Strike over Hungary (T. Meszlényi, Telki, Hungary) 02/28/ 2010 <http://www.youtube.com/watch?v=tPPDjLYMh1M>  
 [2] D.Fazzi and G. Vass (2010) Meteor Örkényről <http://www.youtube.com/watch?v=mvJkhiUUAT8>  
 [3] Kubovics et al. (2010) The 33rd Symposium on Antarctic Meteorites, Abstract 'Kubovics' <http://yamato.nipr.ac.jp/AMRC/symposium/2010/abstracts/Kubovics.pdf>  
 [4] P.G. Vizi (2010) Cassovia / Kassa Meteorite United Videos <http://www.youtube.com/watch?v=zd20psyOors>