METEORITICS: Review Summary Ms 1004
Journal of the Meteoritical Society

Author(s): H.S. Jackson and A.J. Ehlmann
Title: The Kirbyville eucrite

Please answer each question. Detailed comments should be made on the enclosed Comments sheet. Minor comments may be made on the manuscript.

1. Do you recommend this paper for publication in Meteoritics from the standpoints of originality, importance and effectiveness of presentation?

☐ YES, without significant change.

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Rewriting:	_____Minor	_____Moderate	__X__Major
Reorganization:	_____Minor	_____Moderate	__X__Major
Data Improvement:	_____Minor	_____Moderate	__x__Major delete magnetite

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Please make detailed comments below, particularly addressing the quality of the data, soundness and imaginativeness of interpretations, text organization, prose, adequacy of paper's length, omissions or errors of fact, organization of tables, clarity of figures and completeness of reference list. The authors and editors are better served by detailed and specific comments than by those that are too brief. Use additional pages if necessary.

Comments:

Kirbyville has not been described before. Therefore, I believe this paper should be published as a short note. That will mean condensing the text, transferring most of the description of the hand specimen on pages 2 and 3 to figure captions, and putting the chemical analyses into a table instead of reporting them in paragraph form. The table would include Mason's analyses and the authors' probe data, plus the modes and norms. I have red-penned suggested changes (mainly omissions) throughout the text.

The statement (Page 4) that magnetite is present should be deleted--unless the authors can substantiate a spectacular discovery.

It is my impression that this work was done by students, and students should be encouraged. As it stands, the paper is poor, but it can be made acceptable. In note form, there would be no abstract--just terse descriptions, data, and conclusions about the classification. I think all the figures should be published, but the captions should include more information.

Ms 1004

THI Ann: make sure the red copies. > clean

Hiram S. Jac hlmann,
Department of Geol University,
Fort

ABSTRACT

The Kirbyville eucrite fell on November 12, 1906 at about 15:30. The single known specimen of 94.6 g, covered with a black fusion crust with conspicuous flow lines, has a general pyramid shape. The heavily twinned pyroxenes range from En30 Fs29 Wo41 to En38 Fs61 Wo2, and the plagioclases range from Ab14 An86 to Ab8 An92. Modal analysis gives ~~(in weight %)~~ pyroxene 58, plagioclase 37, silica 3 and opaques 2. The Kirbyville meteorite is classified as a non-cumulate, monomict eucrite ~~belonging to the Main Group eucrites~~.

Modes are Not in wt%. Do authors mean norm?

INTRODUCTION

The Kirbyville meteorite fell near a farm house on November 12, 1906 at about 15:30 in Jasper County, Texas (the approximate coordinates: 30°48'N, 93°56W). The fall was observed by at least three members of the resident family who heard a strange noise, saw a stone fall, and immediately recovered the stone embedded about 3 inches in loose sand. The stone remained in the family of ~~Mr.~~ Thomas W. Morgan until ~~Mr.~~ Oscar Monnig obtained the ~~only known~~ specimen ~~of the fall~~

received 20 August 1987

in 1934. Originally the specimen weighed 97.7 g, but subsequent chemical analysis and probe investigations have reduced ~~the specimen~~ it to 94.6 g.

The Kirbyville meteorite has been mentioned in several papers, including Mason et al. (1979), and Heymann et al. (1968). Heymann et al. (1968) ~~dated Kirbyville~~, determined a K/Ar age of 3.2 b.y. and a U/He age of 4.5 b.y. The cosmic ray exposure age of 14.9 m.y. is ~~slightly~~ younger than the average exposure age of 20.6 m.y. for all of the eucrites studied by Heymann et al. (1968).

SPECIMEN DESCRIPTION

The single known specimen (Fig 1) forms a distorted 4-sided ~~truncated~~ pyramid 3.5 cm high with a 4x4 cm base. The ~~truncated~~ top ~~surface~~ is truncated by a slightly concave surface, ~~rectangular in shape,~~ measuring about 2.5x2.5 cm (square?), ~~and is~~ marked by small pits. Most of the specimen is ~~generally~~ covered with a glistening, black fusion crust that is dimpled with small depressions. Radial melt lines originate from a small central knob at the base, where the fusion crust is thinnest, and flow over the sides toward the truncated top, where the crust is thickest. These flow lines suggest that the base was facing forward in flight ~~with the truncated top toward the rear.~~ Two adjacent sides of the pyramid are roughly perpendicular to each other, and to the top, and the base. The other two adjacent sides join as a gentle curve, forming an obtuse angle with the truncated top. Small patches of fusion crust ~~with some of the interior~~ are

absent along two edges of the base, perhaps lost during atmospheric entry. Material to be used for probe sections was cut from one corner of the pyramid.

Under a binocular microscope at 15x magnification, thin cracks forming irregular polygons in the black fusion crust are visible. This likely resulted from cooling of the crust after atmospheric entry and before impact. Numerous yellowish to brown globules discolor the otherwise black fusion crust. The interior on a fresh cut surface is generally gray in color and shows conspicuous dark clasts and unhealed fracture lines.

~~Inspection of~~ the probe section ~~using a petrographic microscope revealed distinct~~ includes clasts ranging from 1-8 mm in diameter. Some of the clasts have subophitic textures ~~of both fine and coarse grains in different clasts are readily visible~~. ~~The coarser-grained subophitic texture has~~ with euhedral plagioclase lathes up to 0.8 mm long (Fig 2A). The interstices are filled with pyroxene crystals that are optically continuous in discrete patches. Clasts with non-ophitic textures contain sporadic subhedral plagioclase and pyroxene crystals up to 0.4 mm in a fine grained matrix of the same minerals (Fig 2B). The pyroxene is ~~intensely~~ twinned with closely spaced lamellae ~~that are~~ < 1 mm in width. The section contains much evidence for brecciation: fractures (Fig 2C), clast outlines (Fig 2B), mosaic and undulatory extinction in the pyroxene and plagioclase crystals, and warping of the polysynthetic twins in the

plagioclase and pyroxene. No evidence for recrystallization after brecciation was observed.

ANALYSIS

Electron microprobe analyses ~~were made on the minerals using an ARL EMX-SM at 15 Kev and with a 20 nA sample current.~~ ~~The almost universally fine twinned pyroxenes have a compositional range of~~ Wo_{2-41}, Fs_{27-61} and En_{30-40} ~~(N = 28) with most of the points centered around Wo_8, Fs_{56}, and En_{36}~~ (Fig 3). The Wo and Fs tend to vary inversely, but the En is more constant, indicating equilibrium crystallization of inverted pigeonite. The plagioclase composition has a range of An_{86-92}, with an average of An_{89}. No significant compositional variations were noted between different points on a given plagioclase grain. Point counts show that the meteorite consists of 2 wt % opaque minerals with a predominance of ilmenite, lesser magnetite, and one grain of chromite. There is also a small quantity of a silica phase (tridymite or cristobalite). ~~seen by the probe.~~

Mason et al. (1979) gave a bulk chemical analysis of Kirbyville (in weight percent) SiO_2 49.8, TiO_2 0.67, Al_2O_3 11.9, Cr_2O_3 0.40, FeO 18.7, MnO 0.54, MgO 6.96, CaO 10.0, Na_2O 0.45, and from this analysis, calculated the mineral weight percentages: plagioclase, 34; pyroxene, 59 and silica, 4.1. A modal point count performed on the probe section for this paper gave (in wt %) plagioclase 37, pyroxene, 58, silica 3 and opaques 2.