COSMOLOGICAL IMPLICATIONS OF EXTINCT RADIOACTIVITY FROM PLEOCHROIC HALOS

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Halos from various short lived polonium isotopes are found in Pre-Cambrian mica. Po-21O, 214, and 218 are involved. These place restrictions on the time period of formation of the basic crustal material of the earth. The short half-lived nuclides of either polonium, bismuth or lead were incorporated into halo nuclei at the time of mica crystallization and significantly existed WITHOUT *the parent nuclides of the uranium series. Thus for Po-218 ($T_{½}$ = 3 minutes) only a few minutes could elapse between its formation and subsequent crystallization of the mica. Otherwise Po-218 would have decayed and no rings would be visible. These halo types are widespread in the Pre-Cambrian granites from Canada, Sweden and Japan.*

Pleochroic halos, which are minute discolorations formed in such substances as biotite (mica) [1,2] and cordierite[3] by alpha particle emission from small radioactive inclusions in the host material, have in some cases been investigated with reference to the stability of the decay constant over geological time.[4]

It has been reported in this connection that autoradiographic studies on Pre-Cambrian mica show slightly radioactive inclusions for type D halos.[5] These D halos were previously thought to be due to Ra-226 ($T_{½}$ = 1620 years) by Henderson, and have heretofore been considered completely devoid of radioactivity.[6] In addition the D halos were previously described as possessing no ring structure.

However, in my own research a light outer ring surrounding the inner aureole has been observed in some very dense D halos[11] in the Ballyellen mica. Further research on D halos reflects alpha activity, possibly from U-236 or Np-237 with an admixture of U-238 and U-235, whereas the U-238 contribution seems to predominate in the later stages.

A largely overlooked aspect of pleochroic halo phenomena involves the restrictions which certain types of halos place on the time period of formation of the basic crustal material of the earth from raw matter, irrespective of the theory that is used to account for the primary existence of the matter. It is to be expected that nuclides with long half-lives, such as U-238 ($T_{½}$ = 4.5 X 10^9 years) and Th-232 ($T_{½}$ = 1.4 X 10^{10} years), would produce halos, and such is the case.[7]

It is not generally recognized that halos due to certain short half-life polonium isotopes (sometimes erroneously identified as "emanation halos"[8]) also exist in far greater abundance than uranium and thorium halos in some mica samples. All previous attempts to account for the existence of the polonium halos have been from the standpoint of a hydrothermal mode of formation.[6]

In the hydrothermal mode it is envisaged that radioactive solutions containing U-238 and daughter products flowed through a small conduit in the mica, thus causing coloration along the conduit and in some cases coloration about small inclusions due to preferential precipitation of certain elements. There is little question that some halos have formed by this process as in many instances uniform coloration may be observed surrounding minute veins in the mica. However, some halos appear to have developed around very small nuclei in the conduits with no trace of radioactive staining along the vein, thus implying that the radioactive nuclides responsible for halo formation were primary constituents of the nucleus.

Two Hypotheses Possible

More significantly, personal observations of a large number of halos indicate that in many cases the polonium, uranium, and thorium halos have formed around very small inclusions with no visible conduit or crack in the mica connecting the halo nuclei. In this case where halos have formed about point nuclei there are only two possibilities: either (1) the small radioactive inclusions crystallized first with the mica subsequently forming around them, or (2) the inclusions were introduced somehow after the mica was formed.

Although, the latter case has been considered a possibility,[2] there are serious questions about this hypothesis, especially for the polonium halos. Halo nuclei of 1-2 microns in radius are not uncommon for the polonium halos and it is difficult to conceive of a mechanism that would introduce inclusions of this size into large thick mica crystals without leaving a damage trail of some sort which would be optically visible. The relatively short half-life of the Po isotopes raises still another objection to this hypothesis by severely restricting the allowable time period for secondary deposition.

Furthermore, when cleaving the mica to obtain

surfaces on which the halo nuclei are exposed, the mica definitely shows evidence of having completely enclosed the inclusion, thus indicating that it had crystallized around the inclusion. It is also significant that polonium halos have been found in cordierite,[3] so that the secondary depositional mode is especially ruled out for this mineral.

Thus by process of elimination, the most clearly evident mode of halo formation for the polonium halos (which arise from point nuclei) is that halo nuclei contained either polonium isotopes or short half-life beta decaying isotopes of bismuth or lead at the time of mica crystallization. For example, since beta emitters do not produce coloration in mica, the formation of the disc-like Po-210 halo may have resulted from either Po-210 ($T_{½}$ = 138 days) directly, or from Bi-210 ($T_{½}$ = 5 days) or Pb--210 ($T_{½}$ = 22 years) by beta decay into Po-210.

The two-ring Po-214 halo could have formed directly from Po-214 ($T_{½}$ = 164 u sec.) or from the beta emitters Bi-214 ($T_{½}$ = 19.7 min.) or Pb-214 ($T_{½}$ = 26.8 min.). The three ring Po-218 halo differs from the above halos in that it was either formed directly from Po-218 ($T_{½}$ = 3 min.) or possibly from the nuclides Bi-218 or Pb-218 which beta decay into Po-218.

The significant point here is that, while the properties of Bi-218 and Pb-218 are as yet unknown,[10] they are probably beta emitters with half-lives much shorter than that of Po-218. (The same conclusions are obtained even if progenitors with atomic number less than 82 are considered as the initial parent nuclides of these halos, since they, too, would be short half-life beta emitters.)

Since Po-214 and Po-210 are alpha emitters which are successive decay products of Po-218, a three-ring halo, such as one shown in Figure 1 will result from the initial presence of about 10^9 atoms of either Po-218, or Bi-218 or Pb-218 in the

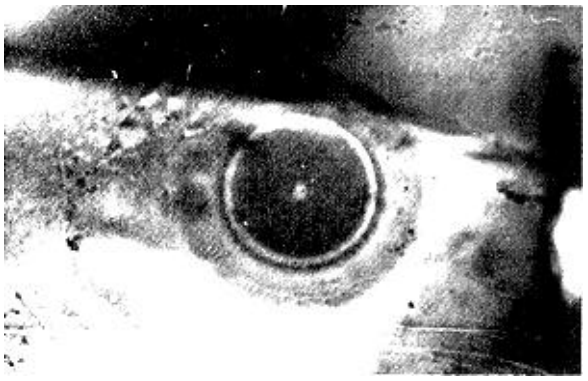
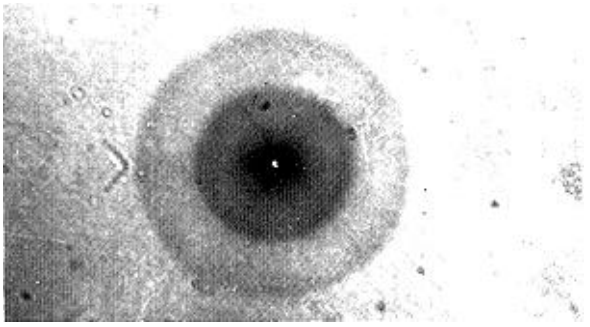


Fig. 1 Po-218 Halo (Enlarged 470X)

central inclusion. The inner ring in Figure 1 is due to alpha emission from Po-210 (radius= 18.8 microns); the second ring corresponds to Po-218 (radius = 22.5 microns); while the outer ring corresponds to Po-214 (radius = 34 microns).



Fig, 2 Po-214 Halo (Enlarged 540X)

The halo in Figure 2 shows an inner ring due to Po-210, an outer ring due to Po-214, and can be accounted for by the initial presence of either Po-214, Bi-214 or Pb-214 in the central inclusion.

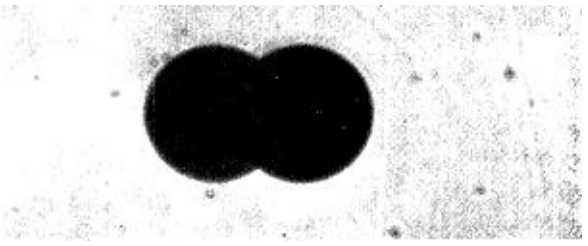


Fig. 3 Po-210 Halo (Enlarged 470X)

Figure 3 shows overlapping Po-210 halos due to the presence of either Po-210, Bi-210 or Pb-210 in the inclusions.

It can be demonstrated that the radon isotopes were not progenitors of these polonium halos since other rings would be visible due to alpha particle emission from these isotopes if this were the case. Using the fission track etching process,[9] numerous background fission tracks may be observed to emanate from the central inclusion of U-238 halos, while no background fission tracks have been observed to emanate from the central inclusion of the polonium halos.

In addition, several mica samples containing U-238 and polonium halos have been irradiated with a neutron flux of about $1O^{17}$ n cm^2. These irradiated U halos reveal a vastly increased number of induced fission tracks, while the irradiated polonium halos still exhibit a complete absence of tracks. These experimental results indicate the absence of U in polonium halos and contradict the hypothesis that the polonium isotopes in these halos were initially derived from uranium.

Autoradiographic experiments carried out over a period of several months sometimes reveal alpha particle tracks from the U and Th halos, but none have ever been observed from the polonium halos. It is also possible to rule out

preferential deposition of short-life nuclides due to laminar flow of radioactive solutions as a possible source of the radioactivity of these halo nuclei, since gross discoloration over wide areas is evident where laminar flow occurs.

New Halo Type

In addition, a new type of pleochroic halo (type Y) has been found in a Canadian mica. The Y halos bear no relation to the well known U-238 and Th-232 halos, since both the magnitude of the halo radii and the ring structure are anomalous, The Y halos have an outer radius of about 26 microns corresponding to an alpha particle energy of about 6.6 MeV.

Although it is not possible to unequivocally identify the isotope responsible for the Y halos, Bi-211 ($T_{½}$ = 2 m) has the correct decay energy and is tentatively identified as the parent nuclide. As was the case for the polonium halos, a fission track analysis revealed the absence of uranium in the central inclusion of this halo.

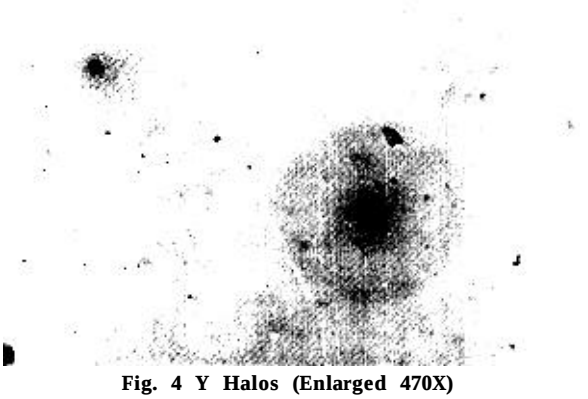


Fig. 4 Y Halos (Enlarged 470X)

Figure 4 is a micrograph of the two Y halos referred to above. The light inner ring in one of the halos corresponds closely to the size of the Po-210 halo, thus implying the central inclusion may have initially contained a combination of the alpha emitters Bi-211 and Po-210. An alternate explanation would be that the inclusion initially contained Pb-211 and Pb-210, which beta decay respectively into Bi-211 and Po-210.

Recent acquisition of Wiman's[12] remaining halo collection revealed the presence of a halo of about 55-60 micron radius as measured from the edge of a large inclusion, thus tending to establish the existence of halo radii far in excess of any expected from U or Th halos. It was pointed out previously that only fairly short half-life alpha emitters could be responsible for these giant halos.[13]

Conclusions

It thus appears that short half-life nuclides of either polonium, bismuth, or lead were incorporated into halo nuclei at the time of mica crystallization and significantly enough existed without the parent nuclides of the uranium series. For the Po-218 halo only a matter of minutes could elapse between the formation of the Po-218 and subsequent crystallization of the mica; otherwise the Po-218 would have decayed, and no ring would be visible. The occurrence of these halo types is quite widespread, one or more types having been personally observed in the micas from Canada (Pre-Cambrian), Sweden, and Japan.

The point in question, and one which has not been heretofore considered seriously, is whether any of these variant halos represent *prima facie* evidence of extinct natural radioactivity due to primordial short half-life alpha emitters. It is believed that the accumulated evidence from the polonium halos, the Y halos, and the giant halos provides an affirmative answer to this question.

It is difficult to reconcile these results with current cosmological theories which envision long time periods between nucleosynthesis and crustal formation. It is suggested that these halos are more nearly in accord with a cosmological model which would envision an instantaneous fiat creation of the earth. The words of scripture relative to this event are, "By the word of the Lord were the heavens made; and all the host of them by the breath of His mouth. For He spake, and it was *done;* He commanded, and it stood fast."

(Psalm 33:6, 9)

Acknowledgments

I wish to express my sincere appreciation to Drs. H. B. S. Cooke, C. G. I. Friedlaender, G. C. Milligan, and E. W. Guptill of the Geology and Physics Departments, Dalhousie University, Halifax, for the loan of Dr. Henderson's fine pleochroic halo collection. Dr. Joly's halo specimens, which were very kindly loaned to me by Dr. J. H. J. Poole of Trinity College, have been of exceptional value, and Dr. D. E. Kerr-Lawson, Swastika Labs, Swastika, Ontario, generously made a gift of his remaining halo specimens.

Valuable mica specimens were also received from Dr. J. A. Mandarino, Royal Ontario Museum, Dr. B. Loberg, Stockholm Univ., Dr. I. Hayase, Kyoto University, Dr. F. Mendes, Lisbon University, Dr. M. Matthias, University of Cape Town, and Dr. R. Gorbatschev, University of Uppsala. Certain facilities of the Oak Ridge National Laboratory were kindly made available through the courtesy of Dr. A. E. Cameron and Mr. Rodger Neidigh of ORNL.

Finally I wish to express my gratitude to Drs. C. L. Thrash, A. M. Thrash, L. B. Hewitt,

Charles Graves, and Mr. R. E. Crawford for support of this research through a grant from the Archaeological Research Foundation of New York City.

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STATEMENT OF RELATION BETWEEN THE CREATION RESEARCH SOCIETY AND THE BIBLE-SCIENCE ASSOCIATION, INC.

Pursuant to a motion by the board of directors of the Creation Research Society, Dr. W. E. Lammerts met with the officers of the Bible-Science Association at the home of Paul Hackstedde, president, on the evening of May 2, 1966. After consultation with Rev. Walter Lang, executive secretary of the Bible-Science Association, the following statement of clarification as to the origin and objectives of the two organizations was agreed upon, and it is hoped publication of this statement will clear up any confusion regarding purposes of each organization.

I.

Bible-Science Association

This originated in the efforts of the Rev. Walter Lang of Caldwell, Idaho to contact scientists and others regarding the soundness and the value of the creation approach to science and religion, It began in September, 1963, with a mimeographed exchange, and this soon became a multilithed Newsletter and then in the summer of 1964 it was printed and a society was organized.

When the society was organized, Paul Hackstedde of the Los Angeles area became president; Herman Voss of Caldwell, Idaho, became treasurer; and Ed Rochlitz of Caldwell, secretary. Directors were selected from Los Angeles; Denver, Colo. and from Michigan. In the Fall of 1965 a branch society was formed in the Los Angeles area with Mrs. Cal (Jean) Sumrall as the secretary. As of July, 1966, the Newsletter, is mailed to 13,000 addresses, all over the world.

This society is primarily a public relations society interested in calling attention of Christian groups and individuals to the books and writings of scientists and organizations that support the creation concept. It is interested in featuring those who oppose mega-evolution, who support a relatively young earth, a universal Flood of World-wide proportions.

The society publishes a monthly Newsletter; it distributes books written by experts in various fields of scientific disciplines, reprints their articles, distributes tape recordings of speeches given at various seminars, distributes slides and filmstrips, and distributes many tracts and booklets. It is also engaged in a radio ministry and offers a fifteen-minute, weekly radio program to radio stations over the country.

The society is supported by subscriptions, memberships, monthly contributions, and distribution of materials. The full-time executive secretary is the Rev. Walter Lang of Caldwell, Idaho.

II.

Creation Research Society

The Creation Research Society originated in 1962 as a team of ten scientists, who exchanged letters as to their views regarding evolution, catastrophism, and the validity of the various ways of presuming to date the age of the earth. It was formally organized in the Summer of 1963 and so far has published three Annuals (including the 1966 issue) and six quarterlies.

It is strictly a research society interested in publishing the technical results of its scientist members' library, laboratory, and field research. The costs of this publication are supported by the dues of active scientist and sustaining members. Also contributions are received from interested groups and individuals.

Since it is primarily a research and publication society, no national meetings are held and decisions are made by a board of directors elected by the active members for a term of three years. Regional meetings of the members of the Creation Research Society are encouraged for the presentation of papers, mutual help and encouragement, and presentation of programs to the general public.