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POLONIUM LOSS FROM GLASSES PREPARED FOR ALPHA COUNTING

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Solution of the Age Equation in thermoluminescence dating technique requires estimates of uranium and thorium in sherd or sediment samples. We have previously reported on thick source alpha counting using fused glass discs for this purpose (Prescott and Jensen, 1980; Jensen and Prescott, 1983). A 1:1 or 1:2 proportion by weight of finely ground sample and anhydrous lithium borate is heated to above 1000 ° C for 15 to 20 minutes in a platinum-gold crucible. The melt is then poured to form a disc which is slowly cooled to room temperature. We follow the procedure described by Norrish and Hutton (1969) for the preparation of discs for XRF analyses. Further details of the recipe and the merits of the method can be seen in the references cited. Our experience in the use of these discs now extends over several years and a critique of the over-all success and limitations will be compiled in the near future. However it would be beneficial to publish, albeit briefly, some of our latest observations in advance. These concern the loss of activity during disc preparation which, if not accounted for, may lead to error in U/Th content calculations or wrong estimates of disequilibrium in the decay series.

At the elevated temperatures achieved during disc fusion, the diffusion out of radon gas is quite well understood and can be corrected for (Jensen and Prescott, 1983). Now we have data which suggests the loss of polonium activity as well. Polonium in its metallic form boils at 962 ° C while all its known compounds either boil or decompose well below this temperature (Handbook of Chemistry and Physics, 1982). Of all the Polonium isotopes in the three natural radioactive decay series, Po-210 in the U-238 series is the only one of significance. It has a half life of 138 days and is a 5.3 MeV alpha emitter. We were able to pick up 5.3 MeV alpha activity on the lid of the crucible in which one of the uranium standard glass discs had been fused. The activity decayed with the half life of Po-210. We also observed the build-up Po-210 activity in a uranium standard disc with the passage of time. These observations explain our previously-reported findings of a consistent difference in the (activity-in-glass/activity-in-sample) ratios for uranium and thorium standards (Jensen and Prescott, 1983).

Further interesting results on the polonium activity loss due to sample heating and the corresponding time-dependent corrections based on alpha range-energy relationships are presently being compiled and will be reported shortly.

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