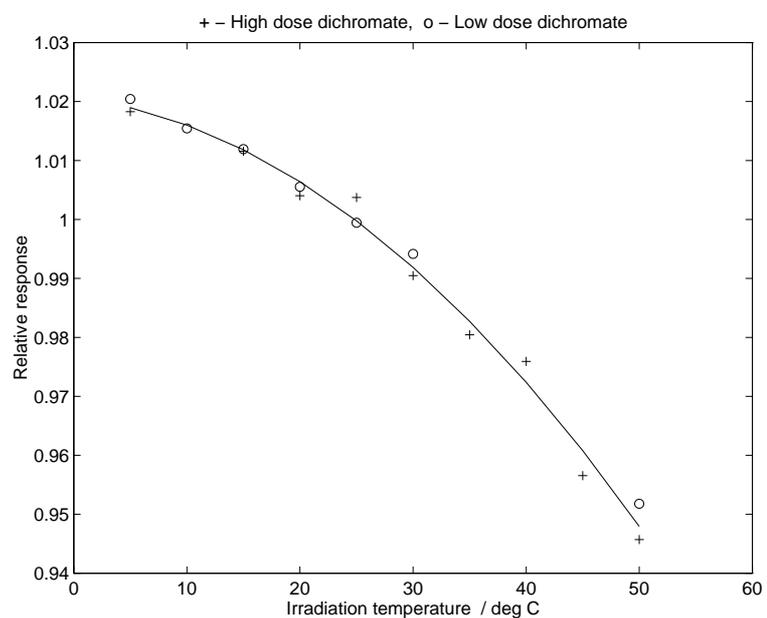


Chemical Dosimetry Service Application Note

The Effect of Irradiation Temperature on the Response of the Dichromate Dosimeter

In common with most types of chemical dosimeter, the response of NPL Dichromate Reference Dosimeters is influenced to some extent by the temperature of irradiation. The effect is well characterised, allowing corrections to be made if the irradiation temperature is known. In contrast, no effect of post-irradiation temperature has been reported in the formulation of dichromate dosimeters used by NPL, and no correction is necessary for post-irradiation storage conditions.

Experiments carried out at NPL have shown no significant difference between the temperature dependence of "high dose range" (10-40 kGy) and "low dose range" (2-10 kGy) dosimeters. The magnitude of the *irradiation temperature coefficient** does, however, depend on the irradiation temperature. This is illustrated in Figure 1, where the relative response of NPL dichromate dosimeters is plotted against irradiation temperature over the temperature range 5 to 50°C. The plot includes both "low dose range" and "high dose range" dosimeters, indicated by circles and crosses, respectively. Doses of 4 and 7 kGy were used for the "low dose range" dosimeter, and doses of 20 and 30 kGy used for the "high dose range" dosimeter. The data have been normalised to the response at 25°C irradiation temperature.



The data between 25 and 50°C represent a temperature coefficient of approximately -0.2% per °C. At temperatures below 25°C, the irradiation temperature coefficient gradually decreases. A 2nd order polynomial function can be fitted to these data, and this is shown as the solid line in Fig. 1.

Dichromate dosimetry results reported by NPL are corrected to a constant irradiation temperature, using the data shown in Fig. 1. If required, users may correct the reported results to another irradiation temperature using these data. Note: the response, i.e. the dose reading, of the dichromate dosimeter *decreases* as the irradiation temperature *increases*.

* *Irradiation Temperature Coefficient* - the fractional change in response per degree Celsius change in irradiation temperature.