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An application and improvement study of CR-39 personal neutron dosimeter

As a passive neutron personal dosimeter, CR-39 solid state nuclear track detector is convenient, cheap, insensitive to gamma and beta rays and has strong anti-interference ability and better response to fast neutrons.A method of neutron dose measurement with CR-39 solid state nuclear track detector is established, consisting of detector preprocessing, neutron irradiation, chemical etching and track reading. A performance experiments are carried out on the CR-39 detector according to the international standard ISO21909-1. The results show that the CR-39 solid state nuclear track detector has good repeatability, batch homogeneity, dose linearity, time stability and environmental stability. By adopting the method of adding the polyethylene and boron converter to CR-39 detector, the optimization design is carried out to improve the energy response of fast neutrons and expand the energy detection range. A set of personal neutron dose measurement methods based on the CR-39 solid track detector has been established by using Monte-Carlo method. To conform the personal neutron dose measurement method, an experimental comparison study is made by using the CR-39 to measure the neutron dose in standard Am-Be, Cf, D2O moderated Cf neutron source radiation field, which the neutron dose distributions were well known. The comparison result shows the deviation of the neutron exposure dose obtained by this measurement method from the actual exposure does not exceed 12%, which has high feasibility and accuracy .

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