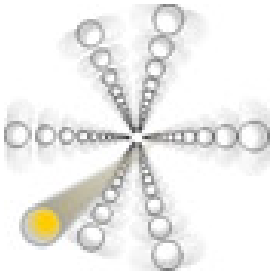

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X-ray Generation from Tribocharging and Feasibility of Application for X-ray Fluorescence Analysis

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X-ray generation by tribocharging is currently an attractive issue. C.G.Camara et al showed that x-rays can be generated by only peeling adhesive tape in vacuum without external electrical high-voltage power supply and demonstrated radiography of human fingers using this unique x-ray source. The X-ray emission, in this scheme, is interpreted as Bremsstrahlung radiation from electrons which are accelerated by the high electric fields that form as a result of charge separation at the dielectric surfaces of the peeling tape. X-ray generation by tribocharging has an advantage of flexibility for device design because of its simple structure and, making use of its flexibility, the x-ray generator is expected to be, not only compact, but also easily customized according to the sample shape.
Here, we proposed and made a prototype of looped-tape style, which consisted of two reels connected with a plastic looped-tape in a vacuum chamber and a shaft of one of the reels was covered with a double-side adhesive tape. In this scheme, x-ray emissions from same point and same angle, while in the original type of one-way wind up style, the emission point and angle are not fixed, but changed according to the remainder of the tape. We investigated its characteristics of the emission such as energy spectra and dependence on vacuum degrees.When the vacuum degrees was varied from 6.0×10-4 to 4.9×10-2 Torr, x-rays with energies over of 10 keV were observed in a vacuum less than 3.1×10-2 Torr, and the photon number was maximized around 3×10-3 Torr, which is similar to the results of E. Constable et al's group. Furthermore, we also showed the feasibility of its application for x-ray fluorescence analysis (XRF). By irradiating the tribocharging x-rays on a stainless-steel plate, the corresponding XRF peaks such as k-α lines of Cr, Fe, Ni were observed.

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