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Parametric X-ray radiation in the backward geometry under interaction of relativistic electrons with crystalline and polycrystalline structures

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Parametric X-ray radiation generated by relativistic electrons in crystals and polycrystals with different quality of grain structures is studied experimentally. The obtained results are compared with the existing PXR theories for crystalline [1] and polycrystalline structures [2]. A deviation between the existing theories and measurements is observed for textured polycrystals which can be considered as a transition structure between crystals and polycrystals. Nevertheless, the comparison can be performed analysing different parameters such as the mosaic degree of the target, electron multiple scattering in the target and the divergence of the incidence beam of charged particles.

The PXR was registered in the backward geometry during the interaction of a 7 MeV electron beam with tungsten, nickel, and molybdenum polycrystalline foils, and highly oriented pyrolytic graphite crystals. The orientation distributions of PXR yield, the PXR peak position and spectral width are analysed. The experimental results are in good agreement with a developed model based on the PXR kinematical theory [3].

References

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