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Data processing for soft X-ray diagnostics based on GEM detector measurements for fusion plasma imaging

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The measurement system based on GEM - Gas Electron Multiplier detector [1] is developed for X-ray diagnostics of magnetic confinement tokamak plasma. The current signal generated by the detector carries information about the energy and position of X-rays. The multi-channel data acquisition system [2] is designed for estimation of the energy and position of an X-ray source. Cluster charge value distribution corresponds directly to the energy spectral lines of X-ray source. Cluster charge position distribution corresponds to the energy for Bragg diffraction precise spectroscopy. The FPGA based system performs the basic functions of data processing: the identification of charge clusters and charge value and position histogramming [3]. Selected data series are transferred to a PC in order to obtain detailed analysis and visualization of results. The system interface, based on MATLAB package, accomplishes control, communication, data processing and imaging results. This allows one to study properties of the detector, measuring system diagnostics, optimization of working conditions and system development. Series of the procedures: multi-channel calibration, energy range control and scaling, have been developed for optimization of the measurement condition, to improve quality of the acquired data and for the efficient presentation of the results.

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Crystallochemical reason for degradation of the Baltic amber (succinite) nugget

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Baltic amber is a fossil resin with ambiguous paleobotanical origin [1]. The X-ray diffraction pattern of pure amber specimen exhibits amorphous character. However, it is possible to observe a crystalline inclusion in the amber matrix [2,3]. We examined with XRD the amber specimens selected from a large collection of the Museum of the Earth of Polish Academy of Sciences in Warsaw. Rietveld refinement reveals that the crystalline content of cracks is indeed different than the depositional environment. Specimens on display can be subjected to changes in humidity and temperature for a long time. Based on the XRD results a crystallochemical transformation pathway is proposed. Thus, the results of our work may provide practical guidance how to prevent disintegration of the amber nuggets.

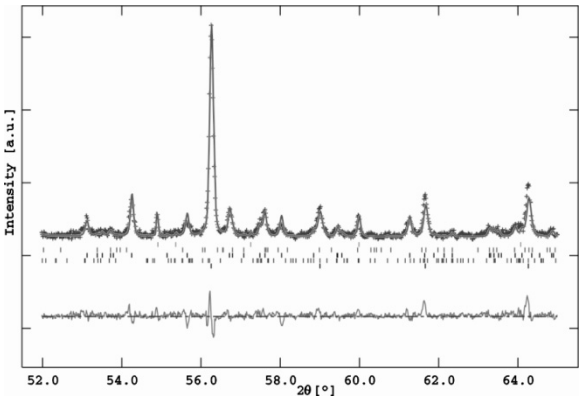

Figure 1. Results of Rietveld refinement of the crystalline content of cracks in amber nuggets.

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