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THE EXPERT SYSTEMS FOR ANALYSIS OF ELECTRON ENERGY-LOSS SPECTRA

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Abstract. The expert systems for analysis of energy-loss spectra are developed with aim to enable qualitatively and quantitatively improvement of process analysis spectra which are obtained in collision processes between electron and atoms or molecules. The expert system contribute to process of spectra analysis firstly in parts of spectra where are many structures and where subjective estimation of a person that performs an experiment can limit a precision of analysis regarding a quantity of obtained data, and also regarding a quality of interpreted results.

The expert systems shown in this paper are developed on the base of backward chaining methodology, and for their development is used ESBT I2+. The process of development of expert system was done in phases. In the first phase the expert system was oriented on atom spectra analysis (Petrović and Bočvarski 2003). The application of thusly developed expert system has given very satisfying results. So we decided to upgrade existing expert system in order to enable analysis of molecule spectra which are far more complex then atomic (because they, beside the peaks of discrete states, also contain peaks of vibrational levels).

On the Fig. 1 is given part of characteristic SO_2 molecule threshold spectrum.

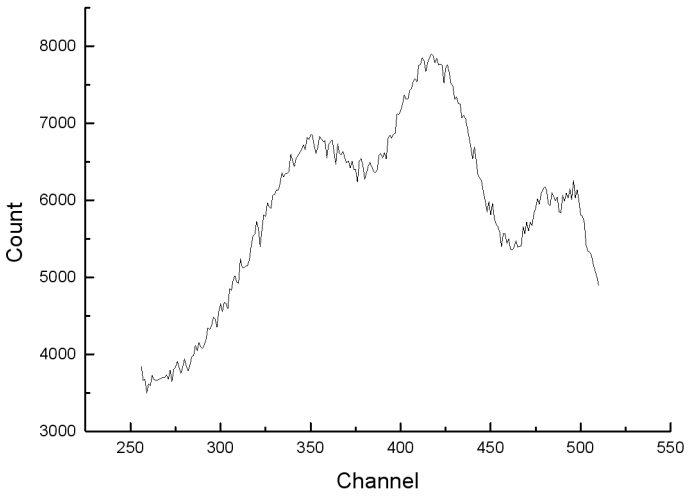

Figure 1: Characteristic SO_2 molecule threshold spectrum in the energy range x-x.

The process of analysis done by expert system should solve the problem of working with complex, compound structures, which stems from overlapping of large number of vibrational level peaks, which are characteristic for this kind of spectra.

In order to solve the aforementioned problem, in first stage of development we started with two-atomic molecules, because their spectra, although complex, are well structurally defined, and also there is a multitude of data for these molecules (Petrović and Bočvarski 2005). This enabled the verification of certain ideas that were later used in analysis of three-atomic spectra (Petrović et al. 2007). This has a special relevance, because it enabled us to obtain certain amount of information from those parts of spectra that remained unanalyzed.

References

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