

MICROSPECTROMETRIC STUDY OF INTERNAL STRUCTURE OF DENTIN-ENAMEL BOUNDARY (DEJ) IN MOLAR TEETH

J. Nowak^{1*}, **R. Chalas**², **J. Lekki**³, and **A. Kuczumow**¹

¹ Department of Chemistry, John Paul II Catholic University of Lublin, Al. Krasnicka 102, 20-718 Lublin, Poland

² Department of Conservative Dentistry, Medical University of Lublin, ul. Karmelicka 7, 20-081 Lublin, Poland

³ Department of Nuclear Spectroscopy, Niewodniczanski Institute of Nuclear Physics, ul. Radzikowskiego 152, 31-342 Krakow, Poland

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*) e-mail: nowakj@kul.lublin.pl

Dentin-enamel junction (DEJ) is unique interface of two natural phases: dentin and enamel in teeth. The studied matrix is generally composed of hydroxyapatite, although in uneven concentrations (up to 97% in enamel while up to 70 % in dentin) and of different structure (greater rod-like crystallites in enamel while ball-like smaller crystallites in dentin) with additions of different organic compounds with main contribution of collagen, essentially in dentin. Due to such composition, the recognition of the space distribution of components is difficult. Using the combination of microspectral methods (X-ray and PIXE) for the determination of inorganic components has to be supplemented with the application of Raman microscope for the recognition

of organic components and it is shown in Fig. 1. The latter method in advanced version permits to locate the area of crystal reorganization. The data are superimposed on the optical image to join the chemical results to the morphological details. Recent study is performed on the teeth of humans, African buffalo and extinct shark. For comparison, the PIXE and optical results for dog, sheep, horse are added.

Beyond the aim to recognize the DEJ structure as strictly as possible, the more far-reaching aim is to have the basis for the biomimetic reconstruction of the junction, also with the manufacturing of the smart dentistic fillings and implants.

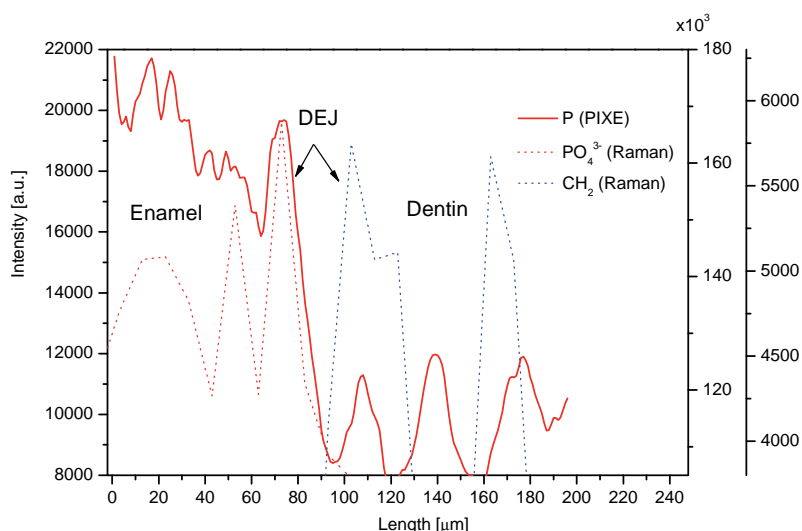


Figure 1. Visualization of DEJ with Raman microscopy (oscillation ν_1 981 cm^{-1} for PO_4^{3-} and 2900 cm^{-1} for CH_2 and complementary partial visualization with PIXE – PK_{a1} signal.