Spectroelectrochemistry: background, materials, instruments, methods and applications

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This two-academic-hours talk will be devoted to various aspects and various methods of spectroelectrochemistry. The first part will start from some theoretical background of UV-Vis-NIR spectroelectrochemistry linking charge spent in electrochemical process and absorbance generated in electrochromic substance. Advantages and drawbacks of various optically transparent electrodes for performing spectroelectrochemistry will be discussed. Review of spectroelectrochemical instruments will describe advantages and drawbacks of double beam and single beam diode-array spectrophotometers, as well as requirements that should be met while choosing proper equipment to study particular spectroelectrochemical processes. Methods of UV-Vis-NIR spectroelectrochemistry (chronoabsorptometry, derivative voltabsorptometry, color impedance) will be described with examples studying particular spectroelectrochemical processes. Methods to separate individual absorption bands at which spectroelectrochemical changes should be registered will be discussed.

The second part of the talk will be devoted to brief reviewing of other types of spectroelectrochemistry: electrochemical impedance (EIS), infrared (IR, FTIR), electron paramagnetic resonance (EPR), Raman. Various realizations of these methods will be discussed such as attenuated total reflection (ATR) for IR-spectroelectrochemistry, angular dependence for Raman-spectroelectrochemistry. Finally some practical applications of spectroelectrochemical processes (electrochromic devices) will be reviewed.

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