Abstract:

This Diploma Thesis focuses on the electrochemistry and spectroelectrochemistry of three new psychoactive substances (NPS). These compounds are easily accessible on the market and they are not regulated by current legislation. Due to the huge amount of these drugs it is difficult to identify them in human organism. Three representatives of new psychoactive substances were studied: two stimulants (3-fluorophenmetrazine, 3-FPM and 4-methylpentedrone, 4-MPD) and one of the fentanyl derivatives (FMAcF, *m*-fluoro methoxyaceyl fentanyl). Drugs often undergo oxidation or reduction during biotransformation in human organism therefore the electrochemical behaviour was studied. The main goal of this work was to determine the initial intermediates of redox processes, clarify reaction scheme (including electron transfer coupled with chemical reaction) and suggest the redox mechanism.

The electrochemical properties were studied using cyclic voltammetry with a glassy carbon electrode as a working electrode. The compounds 3-FPM and FMAcF were oxidized within the available potential window and 4-MPD was both reduced and oxidized. The reaction scheme of all compounds was found to be ECE. UV/Vis spectroelectrochemistry revealed the formation of reaction intermediates. Infrared spectroelectrochemistry and electrolysis followed by analysis using HPLC with diode-array detector, or HPLC-MS/MS, significantly contributed to the clarification of the redox mechanism of these compounds.

Key words: cyclic voltammetry, spectroelectrochemistry, electrolysis, 4-methylpentedrone, 3-fluorophenmetrazine, *m*-fluoro methoxyacetyl fentanyl