



**Prof. Michal Hocek, Ph.D., DSc.**

Head of Research Team in Bioorganic and Medicinal Chemistry

## Supervisor's evaluation and report

on PhD thesis

### New redox labels for DNA

author: **Anna Simonova**

Anna did her PhD work under my supervision from September 2012 till December 2018. She has been working on design and synthesis of new redox-labelled nucleotide derivatives and their enzymatic incorporations to DNA for applications in redox coding of DNA bases and electrochemical analysis. Previously, other students in the group developed several reducible electrochemical labels. Therefore, the task of Anna was to develop several complementary oxidizable labels with different redox potentials. This very challenging multi- and interdisciplinary project on the edge of synthetic, bioorganic and analytical chemistry required to learn a wide range of techniques and skills ranging from organic synthesis, biochemistry and electrochemistry. She prepared a variety of base-modified nucleosides and nucleoside triphosphates (dNTPs) bearing diverse redox labels (methoxyphenol, dihydrobenzofuran, phenothiazine, and different substituted derivatives of ferrocene) and used them for enzymatic incorporations to DNA by polymerase. Then she studied the electrochemistry of the labelled nucleosides, nucleotides and DNA and the applications of the different labelled nucleotides in orthogonal coding of different nucleobases. The project and finishing of the thesis were delayed due to limited stability of some of the labelled nucleotides and difficult enzymatic syntheses of the DNA probes, as well as due to delays in electrochemical characterizations performed at the collaborating Institute of Biophysics. Therefore, Anna has to learn also the electrochemical techniques and did most of the electrochemical studies herself (with co-supervision by Doc. Fojta and Dr. Havran). So far 2 publications in peer-reviewed journals (*ChemPlusChem* and *OBC*) cover two parts of her thesis and at least one more paper will be finished shortly. In these works, she did all or most of the experiments (including planning and evaluation) and contributed to writing up of the papers. In addition, she co-authored two other papers (and several manuscripts in preparation) where she contributed by preparation of redox-labelled nucleotides and nucleic acids.

Anna is a very smart, highly motivated and hard-working young scientist. She has a very good knowledge of organic chemistry, biochemistry and electrochemistry. She already found a postdoc position in the group of Prof. M. Caruthers at the University of Colorado at Boulder.

I am happy to conclude that Anna Simonova fulfilled all the requirements for the PhD title and I recommend her thesis for defense and further proceeding to be awarded the PhD degree.

V Praze 11. 12. 2018



Prof. Ing. Michal Hocek, CSc., DSc.