# P18

# Study of the optical properties of the complexes of carbon quantum dots and compounds with anticancer properties

Martynas Zalieckas[1,2], Katsiaryna Charniakova[2] and Renata Karpicz[2]

[1] Faculty of Fundamental Sciences, Vilnius Gediminas Technical University, Saulėtekio Ave. 11, LT-10223 Vilnius, Lithuania

[2] Center for Physical Sciences and Technology, Saulėtekio Ave. 3, LT-10257 Vilnius, Lithuania· martynas.zalieckas@stud.vilniustech.lt

Quinone-based drugs such as doxorubicin (DOX), daunorubicin, etc. are widely used in cancer chemotherapy. Their use has adverse side effects such as dilated cardiomyopathy and heart failure [1,2]. This has led to the development of controllable nanocarrier-based drug delivery systems that allow for the targeted release of drugs at specific locations. Potential candidates for the development of such systems, heavy metal-free carbon quantum dots (CQD), are receiving increasing attention. Carbon quantum dots (CQDs), with advanced surface functionalisation and luminescent properties that allow the control of the intracellular location of nanocarrier-drug complexes, are a promising nanostructured material for theranostics, as they can simultaneously provide imaging and therapeutic effects [3]. Theranostic agents must meet several requirements. The most important condition is that it delivers the medicine to the target. To do this, it must be soluble in water and stable under physiological conditions. The nanocomplex must be biocompatible. It is highly desirable that it can be tracked optically to monitor its pharmacodynamics and accumulation in cancer tissue.

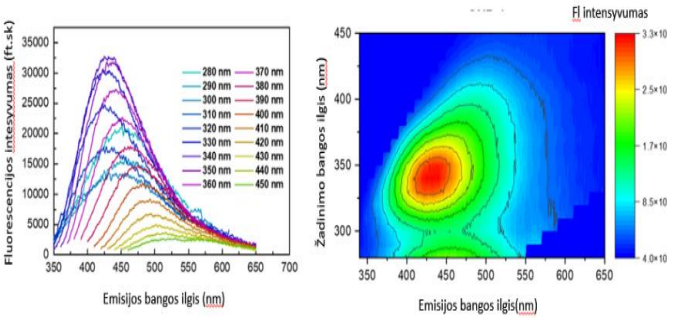


Fig. 1 Excitation wavelength-dependent emission of synthesized CQDs

In this study, our aim was to investigate the optical and fluorescence properties of CQD nanocomplexes with compounds with anticancer properties by spectroscopic methods. DOX and synthesised CQDs were used in the experiments. CQDs were synthesised in our laboratories by anodic oxidation method. The absorption, fluorescence, and quenching kinetics of CQDs and complexes with DOX were then measured.

The luminescence emission of the synthesised CQDs was found to be dependent on the excitation wavelength, which is characteristic of amorphous carbon nanoparticles. After mixing CQDs with DOX, changes in the spectra were observed, indicating the formation of complexes and their chemical stability.

REFERENCES

1. Kaushik, N., Borkar, S. B., Nandanwar, S. K., Panda, P. K., Choi, E. H., & Kaushik, N. K. (2022). Nanocarrier cancer therapeutics with functional stimuli-responsive mechanisms. In Journal of Nanobiotechnology (Vol. 20, Issue 1, p. 152). BioMed Central Ltd. https://doi.org/10.1186/s12951-022-01364-2
2. Kciuk, M., Gielecí Nska, A., Mujwar, S., Kołat, D., Kałuzí Nska-Kołat, Z., Celik, I., & Kontek, R. (2023). Doxorubicin-An Agent with Multiple Mechanisms of Anticancer Activity. https://doi.org/10.3390/cells12040659
3. Azam, N., Ali, N., & Khan, T. J. (n.d.). Carbon Quantum Dots for Biomedical Applications: Review and Analysis. https://doi.org/10.3389/fmats.2021.700403