Cifrul proiectului ANCD 25.80012.5007.36TC

Efficiency of Infrared Radiation in Inactivating Pathogens in the Presence of Metamaterials under Pulsed UV-C Radiation

The project team was initially trained and familiarized with the latest scientific publications, facilitating the successful implementation of the planned experiments. The activities focused on investigating modern decontamination technologies, identifying existing gaps, and exploring opportunities to optimize pathogen inactivation processes and control chemical reactions in biomolecular systems.

A key aspect of the research was the use of light coherence properties to achieve precise control over chemical and biological processes, highlighting significant quantum effects in optimizing biomolecular reactions. Experimental setups combining infrared (IR) radiation with pulsed UV-C radiation were developed and tested, ensuring uniform radiation distribution and maximal efficiency in the decontamination of biological fluids.

The experimental results demonstrated that pulsed UV-C radiation induces rapid photochemical reactions, causing progressive degradation of chromophores and breaking critical bonds in DNA, RNA, and proteins. The spectra obtained under pulsed conditions reveal intense UV absorption, confirming the energy efficiency and immediate effect of the method. The combination of IR and UV-C radiation accelerates these processes and simultaneously optimizes chemical reactions in biological systems, demonstrating the synergistic potential of the two radiation types.

Project findings have been disseminated through presentations at national and international conferences, invention fairs, and scientific publications, contributing to the advancement of knowledge in applied photonics for biomedicine and decontamination technologies. The project provides a solid foundation for developing innovative technologies for pathogen control and manipulation of chemical processes at the molecular level, with potential applications in biomedicine, food safety, and biosecurity.

Conducătorul de proiect Țurcan MARINA

Data: 03.12.2025

L.Ș.