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ЛІНГВІСТИЧНИЙ НАВЧАЛЬНО-МЕТОДИЧНИЙ ЦЕНТР

МАТЕРІАЛИ

XVIII ВСЕУКРАЇНСЬКОЇ НАУКОВО-ПРАКТИЧНОЇ КОНФЕРЕНЦІЇ СТУДЕНТІВ, АСПІРАНТІВ ТА ВИКЛАДАЧІВ ЛІНГВІСТИЧНОГО НАВЧАЛЬНО-МЕТОДИЧНОГО ЦЕНТРУ КАФЕДРИ ІНОЗЕМНИХ МОВ ТА ЛІНГВОДИДАКТИКИ

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"TO MAKE THE WORLD SMARTER AND SAFER"

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To Make the World Smarter and Safer: Матеріали XVIII всеукраїнської науково-практичної конференції студентів, аспірантів та викладачів Лінгвістичного навчально-методичного центру кафедри іноземних мов та лінгводидактики СумДУ (25-26 квітня 2024 р.) / за заг. ред. професора Таценко Н.В. – Суми : СумДУ, 2024. – 168 с.

У матеріалах подані тези XVIII Всеукраїнської науково-практичної конференції студентів, аспірантів та викладачів Лінгвістичного навчально-методичного центру кафедри іноземних мов та лінгводидактики СумДУ. До збірника ввійшли наукові дослідження, присвячені актуальним проблемам сучасних інноваційних технологій та процесів у науці, техніці та різних сферах людської діяльності.

Для молодих науковців, викладачів і студентів усіх факультетів.

За зміст статей і правильність цитування відповідальність несе автор

facilities for handling such waste, so there is a risk that it will end up in conventional landfills and dumpsites with all the possible consequences. State budget expenditures for the purchase of containers and bags, vehicles for waste collection and temporary storage are insufficient. The very low fines for violating the rules of medical waste disposal do not solve the problem either, despite the fact that such facilities can be inspected by the authorized bodies every three years. Currently, the only way to overcome these problems is to implement the National Waste Management Strategy in Ukraine until 2030. The strategy defines the main directions of state regulation in the field of waste management in the coming decades, taking into account European approaches.

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THE EFFECTIVENESS OF MXene-BASED PHOTOTHERMAL THERAPIES FOR ANTIBACTERIAL APPLICATIONS

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Biomaterials technology has experienced notable advancements in recent years. The 2D nanostructures have been instrumental in driving this progress. These nanostructures, characterized by their two-dimensional nature, offer unique properties that make them highly suitable for various biomedical applications. MXene has gained considerable attention and utility since its discovery in 2011 by Professor Yury Gogotsi and his team. MXene represents a family of 2D nanomaterials composed of transition metal carbides, nitrides, or carbonitrides. It is derived from the selective etching of aluminum from layered ternary carbides or nitrides, known as MAX phases. The growing attraction towards MXenes in the research community is indeed justified by their unique and advantageous properties. MXenes have better conduction, hydrophilicity, an elevated superficial area, better mechanical stability, and photothermal transformation effects for different applications. [1, 2]

In the last decade, numerous studies have focused on the application of the 2D materials for their antibacterial properties. Materials based on MXenes are considered reliable candidates for antibacterial applications due to their impressive photo-to-thermal conversion capacity and the potential for synergistic therapies derived from photothermal effects. 2D MXenes possess outstanding advantages in photo-to-thermal conversion due to their inherent large absorption surface, abundant distribution of free electrons, and strong absorption across a broad range of the solar spectrum. [3]

Therefore, it is crucial to provide a detailed description of the photothermal mechanisms of MXenes, as these mechanisms primarily account for their photo-induced antibacterial properties. Combined therapies employing lower light energy consumption demonstrate superior antibacterial potential and cost-effectiveness, achieving a desired synergistic effect. [4]

To understand the photothermal mechanisms of MXenes, numerous innovative studies have been conducted. The mechanism of photothermal therapy lies in materials like MXene absorbing light energy and converting it into thermal energy, which can affect bacteria or other microorganisms. The effectiveness of antimicrobial photothermal therapy is heavily influenced by various laser properties and the selection of photothermal agents (PTAs). Laser parameters such as intensity, frequency, and duration of irradiation may be determined to achieve an optimal antimicrobial effect. Photothermal therapy, serving as a non-invasive anti-infection technique, offers advantages such as broad-spectrum antimicrobial properties, a brief treatment duration, and minimal systemic impact. [5]

The recent studies [6, 7] show that the high antibacterial efficiency of graphene oxide is due to damage to cell membranes due to the formation of reactive oxygen species and extremely sharp edges of graphene oxide. The heat generated by PTAs is affected by various laser light attributes, such as wavelength, power density (total energy per second delivered into a specific area), frequency of irradiation, laser range, and duration. Photothermal therapy in the near-infrared (NIR) spectral region has demonstrated considerably enhanced photothermal conversion efficiencies and increased target penetration, leading to improved antimicrobial effectiveness.

MXenes featuring sharp edges can readily attach to or infiltrate pathogenic cells. Simultaneously, the absorbed light irradiation energy significantly raises the temperature of MXenes nanosheets, inducing hyperthermia. This, in turn, promotes the ablation of bacterial structures, leading to the demise of pathogenic bacteria. Undoubtedly, photothermal therapy (PTT) has gained trust as an antibacterial treatment due to its independence from antibiotics and its capability for selective hyperthermal treatment. [8]

PTT denotes the process wherein a photothermic agent (PTA) transforms light into heat when exposed to a light source, resulting in the efficient eradication of pathogens thro PTT denotes the process wherein a photothermic agent (PTA) transforms light into heat when exposed to a light source, resulting in the efficient eradication of pathogens through thermal effects. These effects encompass the disruption of cell structures and the denaturation of macromolecules, including proteins and DNA. ugh thermal effects. These effects encompass the disruption of cell structures and the denaturation of macromolecules, including proteins and DNA. The typical light source for PTT is near-infrared light (NIR) due to the strong absorption of most biological chromophobe groups in the NIR region, allowing for heat generation through non-radiative transition [9]. Additionally, compared to ultraviolet-visible light (UV-Vis), NIR light can penetrate tissues more deeply without causing damage [10]. The widely used wavelength for NIR light is 808 nm, chosen for its ability to penetrate to a depth of 10 mm [11].

Compared with traditional treatment methods, PTT is not prone to developing drug resistance and can treat microbial infections non-invasively and efficiently, which has made it an attractive therapy. The selection of PTAs is particularly important in PTT. Compared with inorganic PTAs with high biotoxicity, organic conjugated nanomaterials have high biocompatibility, easy modification, and good photothermal properties with great potential in PTT. However, for this potential to be fully harnessed, further studies are crucial to establish a clear protocol for antibacterial PTT.

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SYMPTOMS, TREATMENT AND PREVENTION OF GASTRITIS

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Gastritis is an inflammation of the protective lining of the stomach.

Acute gastritis involves sudden, severe inflammation. Chronic gastritis involves long-term inflammation that can last for years if it’s left untreated.

Erosive gastritis is a less common form of the condition. It typically doesn’t cause much inflammation, but it can lead to bleeding and ulcers in the lining of the stomach.