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Sustainability for resilience, and resilience for sustainability

Biomass-Based Photothermal Composite Material For Sustainable Desalination Solutions

The scarcity of fresh water sources in coastal areas, which is exacerbated by increasing seawater level rise and salinization, is a key issue for sustainable development in the 21st century. In order to solve this problem, numerous methods for desalination were studied and applied including ion exchange membrane distillation, reverse osmosis, and solar steam generation. Among these, SSG shows many merits, such as renewable energy consumption, zero CO2 emission, simple structure and operation, and affordable price. Therefore, it is expected to be a solution to sustain the fresh water sources for undeveloped countries and remote areas. Agro-waste based photothermal materials attract interest recently because of low cost, simple fabrication, and eco-friendly properties. Plants have appropriate characteristics for fabricating photothermal materials to be utilized in SSG systems. In this study, plant leaves and a common agricultural waste were utilized to fabricate the photothermal material that can be applied in the SSG system. The resulting composite material demonstrated significant advantages such as high light absorption, low thermal conductivity, ultra-fast water transportation, low moisture enthalpy, and self-cleaning properties. The biomass based SSG system possessed high seawater evaporation rate and evaporation efficiency, which are comparable to those in the previous studies on biomass composite material based SSG systems. Especially, the SSG system exhibited excellent structural stability that ensures their long-term performance in the seawater desalination. With simple fabrication process, affordable price, and eco-friendly materials, the biomass-based photothermal composite material proves great potential in seawater desalination application.

Prof. Dr.Sci. Nguyen Dinh Duc

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Professor Dr.Sci. Nguyen Dinh Duc is one of the leading scientists in mechanical science. He is the Vice-President of Vietnamese Association in Mechanics and a member of the Professor Election Council in Mechanics of Vietnam. Professor Duc is the Head of Laboratory of Advanced Materials and Structures, the Dean of Department of in Civil Engineering - VNU Hanoi, University of Engineering and Technology (UET) and Program Director of Infrastructure Engineering Program of Vietnam-Japan University (VJU); Director of Undergraduate and Postgraduate Academic Affairs Department, Vietnam National University, Hanoi.

Professor Duc holds a Ph.D. in mathematics -physics from Moscow State University (1991) and a Doctor of Science degree (Dr. Habilitation) in Engineering from Russian Academy of Sciences (1997). He had been appointed to Associate Professor (2007) and Full Professor (2013) at Vietnam National University, Hanoi.

Professor Duc has over 300 publications in which about 200 papers have appeared in numerous ISI (SCI, SCIE) journals. He is the member of Editorial Board of 10 ISI International journal. Last but not least, he has written 5 textbooks and monographs for the undergraduate and graduate programs in Vietnamese, Russian and English.

Professor Nguyen Dinh Duc has been a foreign member of the Russian Academy of Natural Sciences and the member of the International Academy of Scientific Inventions and Patents (since 1999). He was a member of the Central Committee of the Vietnam Fatherland Front (1999-2004), the former Vice-President and Secretary general of Vietnam Science-Technical Association in Russia (1999-2001), former Vice President of Vietnamese Young Scientist Association in Vietnam (2004-2010), Vice President of Univerity of Engineering and Technology, VNU (2008-2012).

Professor Duc has been awarded Silver Medal of Russian Academy of Natural Sciences for the Invention on The law-behavior of mechanical characteristic for three-phase composite 3Dm reinforced by spherical particles (in Russia, 1999) and the Third Prize of “Talented Vietnamese National Award ” (in Vietnam, 2008). Because of outstanding contributions to the national education and training career, professor Duc has received the VNU President's merit of excellence awards in years 2006, 2009, 2011, 2013, 2014, 2015, 2016, 2019, 2020, 2021 and the Prime Minister's merit of excellence award in 2009. He has been selected as one of the most outstanding people in Vietnam education system in 2015, President of Vietnam awarded 3-rd class Labour Medal (2016). Certificate of Merit granted by the Minister of Education of Vietnam, 2019.
Professor Nguyen Dinh Duc was announced by the US journal PLoS Biology to be in the list of the top 100,000 most influential scientists in the world in 2019 and the top 10,000 scientists in the world with the greatest influence in 2020,2021 and ranking 96 in the field of Engineering.

In particular, in 2020, 2021, he was one of the two Vietnamese scientists working locally in the country has entered the most prestigious ranking - 100,000 scientists are ranked to influence the world according to lifelong achievements.