Nano-enabling of sustainable materials in the Philippine countryside

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Sustainable materials such as bioplastics are one of the most anticipated and revolutionary materials replacing many potential packaging applications. A significant part of these bio-based and biodegradable plastics is sourced from renewable biomass such as cellulose, starch, chitosan, alginate, pectin, and zein. Major crops in the Philippines that contain cellulose, and starch produce residues from 26 – 42%. These materials serve as a reliable backbone for the development of bioplastics applications in films useful for bread, fruit, meat, and dried product packaging, either for active or intelligent packaging systems. The world market for smart packaging is expected to reach over USD 33.00 Billion by the year 2028, with a compound annual growth rate (CAGR) of 12%. Specifically, food and beverage are the largest sector for smart packaging, most of which are in the active type of smart packaging.

With such high demand for smart packaging in the coming years, the exploration of advanced materials and nanotechnology in smart packaging has evolved more during the past decade. Nanomaterials structures, morphologies, high-to-surface ratio, and high surface reactivity are some of the properties that can be exploited in smart packaging. In the Philippines, packaging is the largest plastic market segment. Of these, the food industries use most of the packaging supply, accounting for 39.5% of the market share, followed by beverages (37%) and other industries. With such consumption of plastic materials for packaging purposes, food industries must adopt key technologies in improving packaging materials in terms of their smart functionalities and become competitive in the market.

In the Philippines, the University of San Agustin (USA) in Iloilo City established the Center for Advanced New Materials, Engineering, and Emerging Technologies (CANMEET) on March 1, 2022. This research center is the first and only material science and nanotechnology research center in Western Visayas, focusing on using nano and advanced materials for smart packaging technologies in the country. In October 2022, USA was granted an Institutional Development Program (IDP) grant through the Human Resource Development Program (HRDP) program of DOST-PCIEERD. The project is entitled "Hub for Sustainable Smart Nanomaterials in the Philippine countryside" and is housed at CANMEET and aims to acquire state-of-the-art instruments that will enable the establishment of a smart packaging laboratory that uses nanomaterials and nanotechnology, develop and training science, technology, and innovation (STI) talents in the region, and generate proof-of-concept data for succeeding collaborative research proposals.

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Biography

Dr. Noel Peter Bengzon Tan is a Balik-Scientist (Returning-Scientist) from Hong Kong, under the Department of Science and Technology – Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD). He serves as the Director of the University of San Agustin's (Iloilo City, Philippines) newly established research center, the Center for Advanced New Materials, Engineering, and Emerging Technologies (CANMEET). CANMEET is the first and only material science and nanotechnology research center in the Western Visayas Region of the country, established in March 2022. Before settling in the Philippines, Dr. Tan spent over ten years as a Senior Engineer at the Nano and Advanced Materials Institute (NAMI) of Hong Kong, appointed to conduct market-driven research on Nanotechnology and Advanced Materials. He earned his Ph. D. in Applied Chemistry at The Hong Kong Polytechnic University (HKPolyU) and his Master's in Chemical Engineering at Xiamen University, China. Dr. Tan took his Bachelor of Science in Chemical Engineering at Xavier University – Ateneo de Cagayan, Philippines, and his Bachelor of Business Administration from Ritsumeikan Asia Pacific University (APU), Beppu, Japan. He spent four years as a Production Supervisor at the Cannery operations of Del Monte Philippines, Inc. before going back to school and paving the way for his scientific career.