

Macao Funding Scheme for Key R&D

Projects 2021

Application Guideline for Projects of Advanced Electronic Materials

I. Background

At the forefront of the development of smart materials, advanced electronic materials are the convergence and application of new material technology and information technology in the research and development of core strategic materials. The systematic strengthening of the research layout of advanced electronic materials is of vital importance for accelerating the breakthroughs of the technologies of flexible electronics, flexible wearable optoelectronics and logic devices, taking up the dominant role in the development of semiconductor materials and new display materials, and expediting the development of a new generation of information technology industries. The Mainland has also elaborated relevant plans in the National Program for Long- and Medium-Term Scientific and Technological Development Outline (2021-2035) and the Made in China 2025.

The new and high technology industry is the new development focus of the SAR Government. Macao has built a considerable research and development foundation in the field of advanced electronic materials, and it is possible to further develop the field into an industry. Carrying out key research in areas such as display and flexible smart materials is of great significance for promoting the technological development of advanced electronic materials in Macao, forming corresponding high-tech

industries, and enhancing Macao's comprehensive strength in scientific and technological innovation.

In order to fully leverage Macao's advantages in the field of advanced electronic materials, further integrate existing advantaged resources and enhance R&D capabilities and industrialization levels, the Science and Technology Development Fund (FDCT) has, upon seeking opinions from researchers of relevant fields in Macao and expertise from experts in the Mainland, proposed a key R & D project of advanced electronic materials in Macao that aims to: bring Macao's advantages into full play in a planned and step-by-step manner to accommodate the needs of our country; cater to the needs of Macao's social, economic and technological development; promote the appropriate diversification of Macao's economy through technological innovations in support of the development of the International Innovation and Technology Hub in the Guangdong-Hong Kong-Macao Greater Bay Area, thereby contributing to China's development into an innovative country.

II. Overall Objectives

To carry out technical research on high-resolution near-eye displays and flexible energy storage based on the research and development foundation in the field of display and flexible smart materials in Macao and in line with the needs of the development of the International Innovation and Technology Hub in the Guangdong-Hong Kong-Macao Greater Bay Area and regional development; to develop high-performance silicon-based OLED microdisplays through innovative design of OLED materials and device structures and integration of flexible energy storage materials; to conduct production demonstrations

with self-developed vapor deposition pilot lines; and to promote Macao's industrial diversification.

III. Research Field

Focusing on high-performance silicon-based OLED microdisplays, this Guideline addresses basic research and self-development and -production of high-resolution AR/VR near-eye displays, the launch of the design and preparation of silicon-based electrodes, the research and development of flexible energy storage technology, and the development of OLED device structure design, packaging technology and pilot production line equipment.

Performance Indicators:

(1) Establishment of a silicon-based OLED micro-display production demonstration line in the Guangdong-Hong Kong-Macao Greater Bay Area that meets the following requirements: 8-inch silicon wafer for substrate size; CCD alignment system accuracy better than $\pm 7\mu\text{m}$; with an annual OLED micro-display production capacity of 80,000; third-party verification.

(2) Development of full-color silicon-based OLED microdisplay products: white light luminous efficiency $\geq 30 \text{ cd/A}$; half-life $T_{50} \geq 10,000$ hours (@1000 nit); product resolution $\geq 1500 \text{ ppi}$.

(3) Development of aqueous-based flexible energy storage modules with a positive storage capacity reaching 250 mAh/g and above, the ability to be bent repeatedly (>2000 times) and still maintain more than 90% of the initial capacity when bent at 180° , and a cycle stability reaching more than 3000 times.

IV. Application Requirements

The applying entity shall file the application in the form of a project in one of the research topics in the field listed in this Guideline. Each project should be submitted for the application as a whole, and in principle, all the required performance indicators must be covered. Unless otherwise specified, a project should include no more than 3 topics. The leading entity of the project must be a local one but we also encourage cooperation with entities from outside Macao. Every project should be undertaken by no more than 6 entities. Every project leader or topic leader(s) must be qualified to work full-time in Macao.

The implementation period of this project is 3 years. The maximum application amount for each project is MOP 10 million.

V. Experts Involved in the Formulation of the Guideline

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