

# **Macao Funding Scheme for Key R & D Projects 2022**

## **Application Guideline for Projects of Optoelectronic Materials**

### **I. Background**

The optoelectronic industry is one of the important pillar industries in which optoelectronic materials are the foundation and at the forefront, working as an important pillar of the development of the entire information industry. The optoelectronic materials industry has been at the forefront and the focus of global scientific and technological competition due to its strong driving force, extensive penetration, and intensive integration with advanced manufacturing, information technology, biotechnology, and new energy technology. It is also an important development direction of China's strategic emerging industries. The Mainland has made corresponding arrangements in plans such as the National Medium-and-long-term Program for Scientific and Technological Development Outline (2021-2035).

High-tech industries are the development priorities proposed by the Macao SAR government in its Policy Address for the Fiscal Year 2022, whereas new materials are a key industry development area specified in the Second Five-Year Plan for Economic and Social Development of the Macao Special Administrative Region (2021-2025). Macao has a certain R & D foundation in the field of optoelectronic materials, which can be further developed into an industry. Carrying out key research on the new micro-display technology of Micro-LED is of great significance for promoting the development of Macao's optoelectronic materials technology, forming a corresponding

high-tech industry, and enhancing Macao's comprehensive strength in scientific and technological innovation.

In order to give full play of Macao's advantages in the field of optoelectronic materials, further integrate existing advantaged resources and enhance R&D capabilities and industrialization levels, the Science and Technology Development Fund (FDCT) of Macao 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 precision medicine 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 moderate diversification of Macao's economy and the development of the Guangdong-Macao In-Depth Cooperation Zone in Hengqin through technological innovations in support of the development of 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 research on new micro display technology based on Micro-LED relying on Macao's R&D foundation in advanced display and optoelectronic materials, and in response to the construction of the International Innovation and Technology Hub in the Guangdong-Hong Kong-Macao Greater Bay Area and regional development needs.

## III. Research Field

**Research Field:** Key technologies of high-stability

fluorescent quantum dot materials and the application demonstration in new micro display technology for high-definition display.

To develop ceramic-coated high-stability fluorescent quantum dot materials, ultra stable and printable ceramic-coated fluorescent quantum dot material ink suitable for Micro-LED, and new packaging processes, and implement a demonstration application, for the full-color and ultra-high-definition display of Micro-LED.

**Performance Indicators:**

(1) Establishing a new method for high-temperature solid-phase process of ceramic-coated quantum dots, and developing ceramic-coated fluorescent quantum dot materials with a particle size of  $\leq 500$  nm, a fluorescence quantum efficiency of  $\geq 90\%$ , a full width at half maxima of (red  $\leq 32$  nm, green  $\leq 22$  nm). Forming a production demonstration line with a production capacity of  $\geq 30$  kg/month (solid powder);

(2) Developing a fluorescent material ink for ceramic-coated quantum dot nanospheres, and its Micro-LED packaging technology with a device life of  $LT_{90} > 1000$  hours (blue light source 1000 nits) and a blue light leakage rate of  $< 5\%$ , developing Micro-LED device display prototypes, and completing demonstration applications in VR/AR and other micro-display fields;

(3) Applying for at least 5 invention patents.

#### IV. Application Requirements

The applying entity shall file the application in the form of a project under the research topics of the fields listed in this Guideline. Each project should be submitted for the application

as a whole, with content research and performance indicators fully covered. The leading entity of the project must be a local one but we also encourage cooperation with entities from areas outside Macao. No more than 6 participating units in each project are allowed. Unless otherwise specified, a project should include no more than 3 topics. Every project leader or topic leader(s) must be qualified to work full-time in Macao.

The implementation period of the project is 3 years. The maximum application amount for each project is MOP 15 million.

#### V. Experts Involved in the Formulation of the Guideline

Luo Yi	Academician, Chinese Academy of Engineering; Professor, Tsinghua University
Li Jinmin	Researcher, Institute of Semiconductors, Chinese Academy of Sciences
Wu Ling	Researcher, Beijing Semiconductor Lighting Technology Promotion Center
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