創新科技署
Innovation and Technology Commission
香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

By Email

Clerk to the Finance Committee
Legislative Council Secretariat
Legislative Council Complex
1 Legislative Council Road, Central, Hong Kong
(Attn: Ms Anita SIT)

18 June 2020

Dear Ms SIT,

Finance Committee Meeting on 12 June 2020

INNOVATION AND TECHNOLOGY FUND
HEAD 111 – INNOVATION AND TECHNOLOGY
Subhead 104 The Nano and Advanced Materials Institute
Subhead 105 The Hong Kong Research Institute of Textiles and Apparel
Subhead 106 The Automotive Parts and Accessory Systems Research and Development Centre
Subhead 107 The Research and Development Centre for Logistics and Supply Chain Management Enabling Technologies
(FCR(2020-21)1)

At the Finance Committee Meeting held on 12 June 2020, the Administration was requested to provide supplementary information on the technologies or products developed by the Nano and Advanced Materials Institute (NAMI) reaching nanometer standard. The information prepared by the NAMI is at **Annex** for Members' reference.

Yours sincerely,

(Ms Fiona AU)
for Commissioner for Innovation and Technology

c.c. Secretary for Innovation and Technology
(Attn: Ms Sandy CHEUNG and Miss Emily NG)

Secretary for Financial Services and the Treasury
(Attn: Ms Phyllis CHAN and Miss Karen TANG)

Annex

Finance Committee of the Legislative Council

Matter to follow up arising from the meeting on 12 June 2020

Supplementary information from the Nano and Advanced Materials Institute regarding the paper (FCR(2020-21)1)

The Nano and Advanced Materials Institute (NAMI)'s applied research focuses on new material development; new materials with distinctive physical, chemical, electrical, mechanical, optical and other properties created and integrated seamlessly into manufacturing process design to engineer a vast array of innovative and next-generation applications. Nanotechnology in general refers to the maneuvering of matter on a nanoscale, typically ranging from one to several hundred nanometers (nm). Some new materials developed by NAMI are in nanoscale; NAMI's nanofiber, nanobubble and nano coating are some of the representative examples on how NAMI's nanotechnology research creates advanced materials for new products development.

2. Nanofibers are fibers with diameters in the nm range, with an average of several hundred nm, which is about one three hundredth of a human hair. NAMI has developed a patented nanofiber platform with advanced electrospinning technology; unique polymer solutions are developed and drawn into nanofibers by applying a high voltage electric force. The electrospun nanofibers form a highly porous structure and can be functionalised with additional feature, such as antimicrobial function. NAMI's nanofiber has been successfully adopted in the world's first nanofiber facemask – NASK, a super breathable facemask with bacteria killing property and manufactured in Hong Kong, is compliant with the FFP2 standard of the European Union. Since the fibers are in nm range, it is effective in removing most of the airborne

contaminants, from viruses and bacteria with sizes in the nm range to pollutants such as particulate matter 2.5 (PM2.5) that is in micrometer range which can be cut off. In addition, an all-in-one nanofiber HEPA (High Efficiency Particulate Air) filter – multiHEPA has also been developed with NAMI's functionalised nanofibers. It is not only capable of filtering 99.97% of particles at the most penetrating particle size of 300 nm, but also equipped with bacteria killing and volatile organic compound removal functions.

3. In the recent combat of COVID-19 pandemic, NASK has been adopted by the Hospital Authority and multiHEPA is integrated for trial onto a movable ventilation device specifically designed by the Electrical and Mechanical Services Department for the Hospital Authority.

4. NAMI has also developed nanofiber separators for lithium-ion batteries with electrospinning technology. The diameter of the nanofiber ranges down to 50 to 100 nm. With the nanofiber 3D network sponge-like structure, the battery separator has good elasticity, high porosity and excellent flexibility. It improves the battery safety, reduces the internal resistance to ensure a high power output and makes the battery flexible for high performance in different Internet of Things applications, including a commercially available LoRa based tracking device.

5. Another representative example is NAMI's nanobubble technology to increase the dissolution of air or ozone in water. With a novel configuration of nanobubble generator, more than 10 million units of nanobubble with the diameter of nanobubble ranges from 50 to 300 nm can be generated in 1 mL of water, which will increase the dissolved oxygen or ozone content. The oxygen nanobubble provides oxidising power in water so as to enhance the growth rate of hydroponic plants and fish, and the ozone nanobubble with sanitising power reduces the bacteria in wastewater. Four companies in Hong Kong have licensed

NAMI's nanobubble technology for hydroponics, aquaponics, fish farming and wastewater treatment.

6. Furthermore, by dispersing nanoparticles in the cementitious coating, NAMI has developed a nano cementitious coating with superior waterproof performance and durability. The coating has high flexibility and excellent adhesion to concrete and brickwork, and can be applied directly on wet surfaces. The coating has already been applied at various sites with over 400 000 sq. ft. in Hong Kong.

7. NAMI has been supporting the industry through research and development on new materials which include those of nano scale. By adopting new materials including those in nanoscale, NAMI has developed different new products to achieve the desired benefits for innovation and commercialisation. Part of the relevant work and achievements of NAMI has been uploaded to https://www.nami.org.hk.

The Nano and Advanced Materials Institute
June 2020