Press Release
新聞稿

**Annex**

# PolyU Projects with 2018 TechConnect Global Innovation Awards

## Composite multi-layers capacitors with colossal permittivity for electronics and energy storage applications

***— Professor HAO Jianhua, Professor & Associate Head, and Ms TSE Mei-yan, Department of Applied Physics, PolyU***

With global demand for energy storage growing rapidly over the past decade, surging research efforts worldwide have been put in developing novel capacitors, which can achieve fast charging, high power density and long cycling lifetime than conventional batteries. This innovation of PolyU is the first report on simultaneously achieving large dielectric constant (i.e. a lot of energy can be stored); negligible dielectric loss (i.e. energy not leaking out and being wasted easily) and high energy density in flexible composite capacitors based on metal-ion co-doped colossal permittivity materials.

The host titanium dioxide used in this colossal permittivity system is environment-friendly, non-toxic and abundant. The process developed (solution casting and hot-pressing technique) is relatively simple and low cost for mass production of the composite films, as the ceramic powder fillers are fabricated by conventional solid-state sintering method. The dielectric capacitors we developed based on composite multi-layers present a relatively high dielectric constant with exceptional low loss. The maximum energy density achieved simultaneously is remarkable compared to nano-composites with other ceramic particle fillers. Such novel composite multi-layers capacitors are expected to be greatly superior to the conventional one-dielectric currently used in such systems. Moreover, power electronic applications are currently limited by the capacitor size and performance. Multi-layered capacitors can be easily patterned, with fully solid-state construction, thus being superior to conventional electrochemical construction in many aspects including improved safety.

## Low cost flame retardant treatment for cotton with co-catalyst system

***— Dr KAN Chi-wai, Associate Professor, The Institute of Textiles and Clothing, PolyU***

Fabrics made from cellulosic fibres, such as cotton and linen, will burn easily with a high flame velocity. Many flame retardant (FR) agents and application methods have been developed for producing FR textile materials. However, for being efficiently fixed to cotton fibres, the FR agents must be used in combination with a resin and catalyst which may introduce side effects such as reduced tearing strength and whiteness. In this invention, co-catalyst is used which can effectively enhance FR treatment and minimise the side effects of FR treatment. The finishing formulation developed is applied to cotton fabric by conventional pad-dry-cure finishing techniques.

This technology is more cost-saving than conventional methods, as it can reduce the curing temperature and time used for FR treatment, and retain good FR property of cotton fabric even at a lower curing temperature and shorter curing time. It can also effectively minimise the side effects after FR treatment.