# Organometallic Polymeric Photonic Bandgap (OMPBG) Hybrid Materials
# 有機金屬光能隙晶體複合材料開發

By preferential sequestering of oligo (styrene)-organometallic complexes into a self-assembled lamellar diblock copolymer, organometallic photonic bandgap materials exhibiting a high reflectivity for light in the visible range can be obtained. The utility of the block copolymer template approach lies in the spatial morphology control that is determined by the block composition and molecular weight, so an extension to 2D and 3D systems is feasible. ITRI has successfully produced highly regular 1D (lamellar), 2D (cylindrical hexagonal stack) and 3D (gyroid) structures. The reflectivity and dominant wavelength can be adjusted through compositions. A zone-heating scheme makes large (> 0.5 mm) grain size possible.

發展可見光區高反射率的有機金屬光能隙晶體材料：藉由寡聚苯乙烯官能化的有機金屬均勻分散於一維多層雙團聯共聚物光能隙晶體中，以增加材料中介電常數比，增強材料的反射率，並將此技術拓展至二維三維光能隙晶體材料。目前工研院已製成數類有規則的一維／二維／三維材料，並可經由團聯共聚分子的比例調整主要反射波長及反射率，並利用區段加溫技術達成大晶粒（> 0.5 mm）的要求。


Oligo (styrene)-organometallic complexes



One dimensional PBG
2002/08

## Results

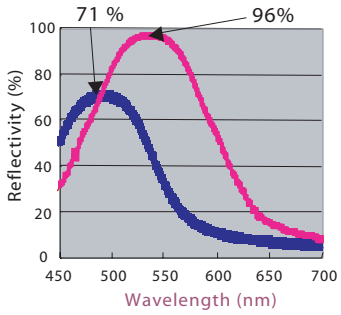
1.One-,two-,three-dimensional PBG
2002/08

1.Block copolymers self-assemble into one-, two-, and three-dimensional periodic equilibrium structures, which can exhibit photonic bandgaps.

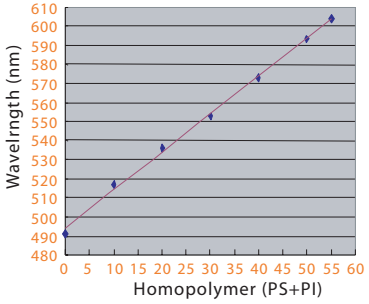
2.There is a monotonic increase in the peak reflective wavelength with the fraction of homopolymer.

3.The peak reflectivity occurs at $\lambda$ = 483 nm for the pure block copolymer sample (Blue line, 71%), and at $\lambda$ = 537 nm for OMPBG (Pink line, 96%).

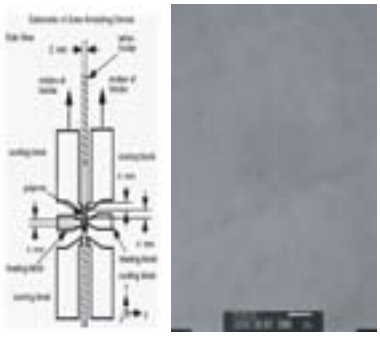
4. Samples were prepared in a "zone heating device" (by Hashimoto, Kyoto University) resulting in grain size > 0.5 mm.




3.Plot of the measured reflectivity for normal incidence of the pure block copolymer (blue line) and organometallic photonic band gap materials (pink line).
2003/04




2. Wavelength of peak reflectivity vs. homopolymer weight fraction
2003/02



4. Representative TEM image of a single lamellar grain prepared by the zone heating process.
2003/05

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