



Nature Photonics期刊重点报道理化所一维有机纳米有序组装结构研究新进展

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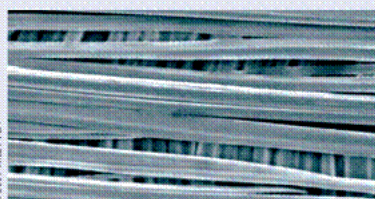
Nanowire films in order

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One-dimensional organic nanomaterials are potentially attractive for building miniature optoelectronic devices.

Before they can be put to use, however, cost-effective fabrication and assembly processes are essential. Now, Chengyi Zhang and colleagues from China have demonstrated a simple one-step process for growing single-crystal organic nanowires and assembling them into aligned films. The trick is to perform the fabrication at a liquid-liquid interface between dichloromethane (DCM) and water. By evaporating the liquid solvent, DCM, organic nanowires form and then assemble into ordered films, owing to a compression force that results from the shrinking DCM-water interface. Zhang and colleagues say that the resulting films can be easily transferred to a substrate or



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stacked to form a multilayer film for device applications. As a proof of concept, the researchers prepared a film of nanowires doped with squaraine dye and used it to create a photodetector and a field-effect transistor. Excellent photoresponse and stability were obtained, demonstrating the versatility and scalability of this fabrication technique for forming large-scale, compact films of organic nanostructures at low cost.

近日, *Nature Photonics* 2009, 3(8), 442 以“Nanowire films in order”为题报道了中科院理化技术研究所张晓宏研究组一维有机纳米有序组装结构研究取得的最新进展。相关论文已发表于《先进材料》(*Adv. Mater.* 2009, 21(41), 4172-4175.)。

一维有机纳米结构的生长及器件研究受到了越来越多地关注,但是,关于一维有机纳米有序组装结构方面的报道却很少。为了实现一维纳米结构在纳米光电子器件和其它领域的应用,需要可控将其组装成有序结构。因此,一维纳米结构的有序化具有十分重要的研究意义。张晓宏研究组在前期研究工作的基础上,把简单的溶剂挥发生长纳米线和液-液界面的自组装方法结合在一起,实现了一步法制备有序排列的较大面积有机纳米线膜。其生长过程及机理为:在一个盛有有机溶液和水的两相体系长方形容器中,有机溶剂的挥发诱导有机纳米线的生长,同时又使液-液界面不断收缩;不断收缩的液-液界面挤压吸附在界面上的有机纳米线,促使这些纳米线达到有序排列(垂直于界面收缩方向)。当溶剂挥发完后,有序排列的有机纳米线将以膜的形式漂浮在水的表面,可以利用简单的提拉法,将这些膜转移到各种衬底表面,或者层层组装为多层结构。研究表明,有序排列的纳米线膜可应用于光电器件制备,所制备的方酸染料纳米线器件具有良好的光开关性能。

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