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Aero-ZnS architectures with dual hydrophilic–hydrophobic properties for microfluidic applications

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Abstract

Here, we report on a new aero-material, called aero-ZnS, representing self-organized architectures made of ZnS hollow micro-tetrapod structures with nanoscale thin walls. The fabrication process is based on the hydride vapor phase epitaxy of CdS on sacrificial micro-tetrapods of ZnO with simultaneous or subsequent transformation of CdS into ZnS and removal of the sacrificial ZnO crystals. The nanostructure of the obtained ZnS hollow micro-tetrapods exhibits the polytypic intergrowth of wurtzite- and sphalerite-type phases perpendicular to their close packed planes. The inner surface of the micro-tetrapod walls preserves oxygen sites, as demonstrated by imaging based on electron energy-loss filtering. The self-organized aero-ZnS architecture proves to be hydrophilic under tension and hydrophobic when compressed against water. Self-propelled liquid marbles assembled using ZnS hollow micro-tetrapod structures are demonstrated.