

高分子络合法自组装ZnO纳米结构和形貌调控

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Tunable Morphology of ZnO Nanostructures Self-Assembled by Polymer Complexation Process

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摘要 研究采用高分子络合法工艺制备ZnO纳米结构材料时晶体尺寸、形貌和质量的控制影响因素和机理.发现ZnO纳米结构的自组装生长由其极性生长特征和高分子网络骨架限域所决定.采用不同络合材料可调控ZnO纳米结构的形貌,如以聚乙烯醇、聚丙烯酰胺等高分子材料作为络合剂时,分别可以得到均匀直径的ZnO纳米棒、纳米线,而作为对比,当以氨水、柠檬酸钠和六亚甲基四胺等小分子材料作为络合剂时,则分别得到ZnO纳米花、纳米片和棒槌状纳米棒;控制适度弱碱性的络合溶液pH值有利于ZnO纳米结构沿[0001]取向生长,在弱碱性溶液中易得到长柱状ZnO纳米线,而在强碱性溶液中易形成短的ZnO纳米棒以至颗粒.

关键词: [低维氧化锌纳米结构](#) [自组装](#) [高分子络合](#) [控制生长](#)

Abstract: Influence of various factors on the growth behavior of ZnO nanostructures self-assembled by polymer complexation process and growth mechanism is discussed. Investigation on the self-assembling formation mechanism of ZnO nanostructures revealed that the growth of ZnO nanostructures was in well accordance with the polar growth behavior and polymer grid backbone localization model. The ZnO nanostructures can be tailored by using different complexing media. The regular wire-like, flower-like, flake-like and club-like ZnO nanostructures were obtained by using polymer such as PVA and PAM, ammonia, trisodium citrate (TSC) and hexamethylene tetraamine (HMTA) as complexing media, respectively. The weak base of the complexing solution at suitable pH value promoted the [0001] oriented growth of ZnO in the self assembling process thus leading to the ZnO nanorods/nanowires. By reasonable selection and adjusting the factors such as complexing media and the basicity of the complexing solution, the crystal growth and morphologies of the ZnO nanostructures can well be controlled.

Keywords: [low-dimensional ZnO nanostructure](#), [self-assembling](#), [polymer complexation](#), [controlled growth](#)

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