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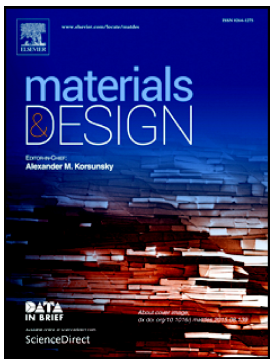

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Fractal characteristics and quantitative descriptions of messily grown nanowire morphologies

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Abstract

This paper studied fractal characteristics of messily grown nanowire morphologies using Monte Carlo simulations and fractal geometry. Herein, the simulated morphologies were generated by Monte Carlo method and their fractal dimensions were calculated by box counting method. An empirical model was developed to describe the relationship between fractal dimension and quantity, average length, and average radius of nanowires. It was found that the fractal dimension is mainly controlled by nanowire quantity, average length and radius. Furthermore, statistical analysis of the simulated morphologies also revealed that the geometrical structure of simulated morphologies is uniform. Finally, the proposed fractal model and parameter estimation method was applied to quantitatively analyze the fractal characteristics, quantity and average length of messily grown Si nanowires synthesized by silver catalyzed chemical vapor deposition. The experimental morphologies have typical

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