Absorbing phase transitions in diluted conserved threshold transfer process

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The critical behavior of absorbing phase transitions in the conserved threshold transfer process (CTTP) was investigated via Monte Carlo simulations on a diluted lattice of the disorder concentration x (= $1-p$, p being the percolation probability), i.e., on an infinite percolation network and on a backbone network. It was found that the lattice dilution was irrelevant as long as $x < x_c$, implying that the critical behavior on a diluted lattice is similar to that on a pure lattice and is also consistent with the recent observation for the CLG model, but with no indication of an existence of the Griffith phase in which active-particle density yielded nonuniversal power-law decrease for the models in the directed percolation universality class. For $x = x_c$, on the other hand, the universal critical behavior was observed with the critical exponents different from those of the pure CTTP model, unlike the CLG model for which active-particle density yielded nonuniversal power-law behaviors.† The CTTP model on a backbone network was also investigated, and the results were found to be similar to those on an infinite network and also similar to those of the CLG model on a backbone network. It is, therefore, concluded that the sites on dead-ends and dangling-blobs yield null effect on the critical behavior in the CTTP model, whereas those sites result in nonuniversal power-law decreases. Simulations on higher dimensions were also carried out, and the critical behavior of the CTTP model on a critical percolation network appears to be independent of or, if not, weekly dependent on the lattice dimensionality.

† S. B. Lee, Phys. Rev. E **84**, 0141123 (2011).