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Nonequilibrium phase transition of a model of diffusion, aggregation and fragmentation on complex networks YUP KIM, SUNGMIN LEE, SUNGCHUL KWON, Department of Physics, Kyung Hee University — We investigate condensation phase transitions of symmetric conserved-mass aggregation (SCA) model on random networks (RNs) and scale-free networks (SFNs) of degree distribution $P(k) \sim k^{-\gamma}$. In SCA model, masses diffuse with unite rate, and unit mass chips off from mass with rate ω. The dynamics conserves total mass density ρ. In the steady state, on RNs and SFNs of $\gamma > 3$ for $\omega \neq \infty$, we numerically show that SCA model undergoes the same type condensation transitions as those in regular lattice. However the critical line $\rho_c(\omega)$ depends on network structures. On SFNs of $\gamma \leq 3$, the fluid phase of exponential mass distribution completely disappears and no phase transitions occurs. Instead, the condensation with exponentially decaying background mass distribution always takes place for any non- zero density. For the existence of the condensed phase for $\gamma \leq 3$ at the zero density limit, we investigate one lamb-lion problem on RNs and SFNs. We numerically show that a lamb survives indefinitely with finite survival probability on RNs and SFNs of $\gamma > 3$, and dies out exponentially on SFNs of $\gamma \leq 3$. The finite life time of a lamb on SFNs of $\gamma \leq 3$ ensures the existence of the condensation at the zero density limit on SFNs of $\gamma \leq 3$. At $\omega = \infty$, we numerically confirm that complete condensation takes place for any $\rho > 0$ on RNs.

Yup Kim
Department of Physics, Kyung Hee University

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