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 $\omega$. The dynamics conserves total mass density $\rho$. 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.

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