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Correlated rigidity percolation and gelation of colloidal particles

SHANG ZHANG, LEYOU ZHANG, Univ of Michigan - Ann Arbor, D. ZEB ROCK-LIN, Cornell University, XIAOMING MAO, Univ of Michigan - Ann Arbor — Rigidity percolation on a lattice with sites or bonds randomly diluted is controlled by the isostatic point, where the degrees of freedom and constraints balance, and the system is at the verge of mechanical instability. In the case of triangular lattice rigidity percolation occurs very close to $p = 2/3$ as predicted from isostaticity. Interestingly, we found that when the site dilution is correlated, this transition occurs at a lower p , meaning that less material is needed for rigidity in the disordered structure. This correlation may be seen as a consequence of short range attraction between the particles which makes them cluster. We characterized critical scaling associated with the site correlation parameter, and will discuss implication to understand experimental systems such as gelation of colloidal particles.

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