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Percolation and Gelation

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The sol-Gel transition, as well as the vulcanization of Polymers chains, was described long ago by Flory, Stockmayer, Zimm within mean field approximation. This however had strong limitations because both excluded volume interactions and loops were neglected. An important progress was made when an analogy between percolation and gelation was made by de Gennes and Stauffer. We will discuss some recent experiments showing the relevance of percolation in the description of the sol-gel transition, as well as another important concept also introduced by de Gennes concerning the possibility of observation of classical exponents in the case of vulcanization. We will also consider briefly the influence of diffusion on aggregation properties. Our understanding of dynamical properties close to the sol-gel transition is lower than that of the static ones. Some analogies were given by de Gennes to describe various hydrodynamic limits, but the experimental results still lead to some discussions. Finally, we will mention some generalizations and open questions.