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The effect of shearing on colloidal gels using small-angle light scattering TAHEREH MOKHTARI, CHRISTOPHER SORENSEN, AMIT CHAKRABARTI — We investigated the effect of shear on the structure and aggregation kinetics of polystyrene colloidal gels. We used 20 nm polystyrene latexes and $MgCl_2$ to induce aggregation. We rotated the sample for 30 seconds at different times after the onset of aggregation. We used static light scattering to observe the structure of the gel. Rotation rates varied between 0.81 rpm and 27 rpm (Proportional to shear rate). When shearing the sample soon after mixing polystyrene and $MgCl_2$, the aggregation followed DLCA kinetics, which yields a fractal dimension of 1.8. The gel time also remained nearly the same as the no shear situation. However, shearing at high rates during the later stages of gelation shortens the gel time, and causes a crossover between two different fractal dimensions due to shear-induced aggregation. At intermediate shear rates, there is a crossover in the structure after the shearing stops, but eventually Brownian aggregation overcomes the shear-induced double structure, so that the fractal dimension regains 1.8 ± 0.1. At low shear rates, there was no crossover and the fractal dimension remained at 1.8. However, at all shear rates, there is a sudden change in light scattering when shearing is done at the later stages of gelation implying shear induced aggregation. The shear rate needed to change the gel structure depends on the stage of gelation. The later the stage of gelation, the lower the shear rate needed to overcome the Brownian aggregation.

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