Supplemental material to:
"Syneresis and delayed detachment in agar plates"

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1 Supplemental movies

Supplemental movie 1 illustrates the syneresis process and the gel detachment for ten plates from a single batch placed without their lid in a thermoregulated chamber at T=25°C (gray bullets in Fig. 5 of the main text). Gels progressively release water that evaporates up the moment they detach from the sidewall of the dish, at the exact angular location where their initial thickness was minimal along the plate periphery at the beginning of the experiment. Note that the detachment occurs after a duration ranging from 3.66 to 18.16 hours for this batch and is therefore refered to as *delayed*. After the detachment from the wall, the gels shrink significantly in the horizontal direction.

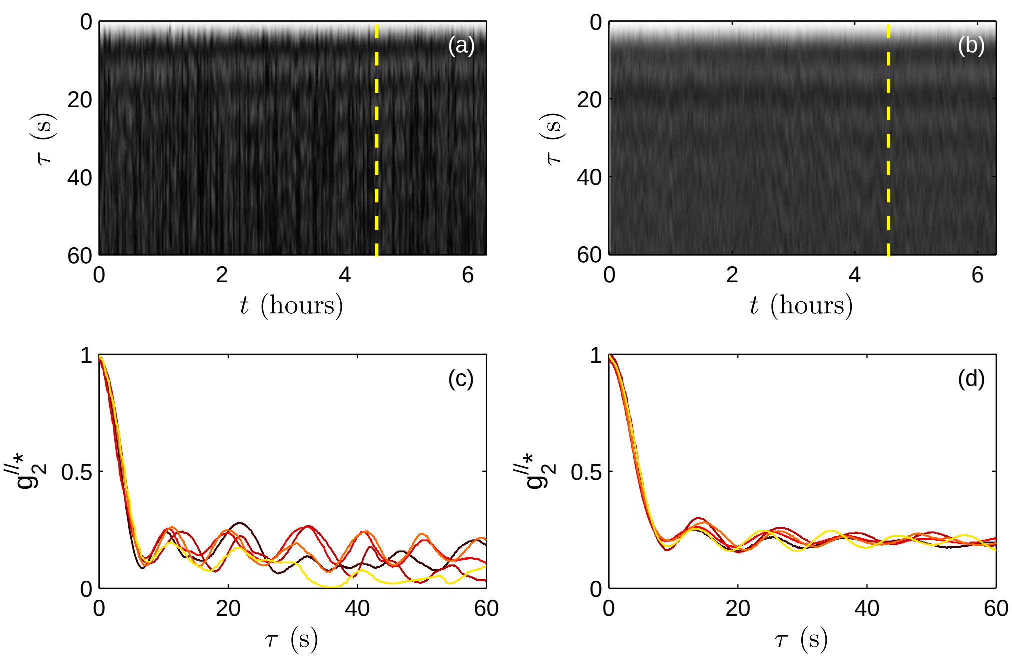

Fig. 1 (Color online) (a) and (b) Lag-time temporal diagram of the intensity correlation function $g_2^{*//}(t,\tau)$ coded in grayscale, as a function of the lag time τ and the experimental time t. (c) and (d) Intensity correlation function $g_2^{*//}(t,\tau)$ vs. lag time τ extracted from (a) and (b) at $t = 4.5$ hours for five consecutive one-minute analysis of the speckle correlation. Experiments are performed in parallel configuration (see section 2.3. of the main text) on a gel casted in a plastic Petri dish for (a) and (c), and in a circular dish made of glass of internal radius 39 mm for (b) and (d). The macroscopic detachment of the gel from the sidewall of the dish occurs at $t = 16$ hours for the plastic plate (gel mass $m = 26$ g, $e_{min} = 3.74$ mm, $\delta e = e_{max} - e_{min} = 0.75$ mm) and at $t = 34$ hours for the glass plate (gel mass $m = 22.6$ g, $e_{min} = 4.5$ mm and $\delta e = e_{max} - e_{min} = 0.7$ mm).

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2 Supplemental figures

Supplemental figure 1 illustrates the lag-time temporal diagram of the intensity correlation function $g_2^{*\perp}(t,\tau)$ coded in grayscale, associated to the dynamics of a commercial gel in a plastic Petri dish [Fig.1 (a)] and of a homemade* gel in a dish made of glass [Fig.1 (b)]. The glass dish behaves as a non-deformable container which reflects in the temporal evolution of $g_2^{*\perp}(t,\tau)$ which is much smoother than compared to the results obtained in a deformable plastic Petri dish. Indeed, consecutive correlation functions computed over $\tau = 1$ min display less variations in the case of the glass dish than in the case of the plastic dish [Fig.1 (c) and (d)]. This experiment demontrates that the stress exerted by the contracting gel on the dish during water evaporation plays a role in the quickly changing dynamics observed in plastic dishes and reported in figure 4(a) and 6 in the main text. Nonetheless, let us emphasize that the fluctuating dynamics of the speckle pattern is still visible in a rigid container and is therefore mainly caused by the gel displacements, which makes it worth studying.

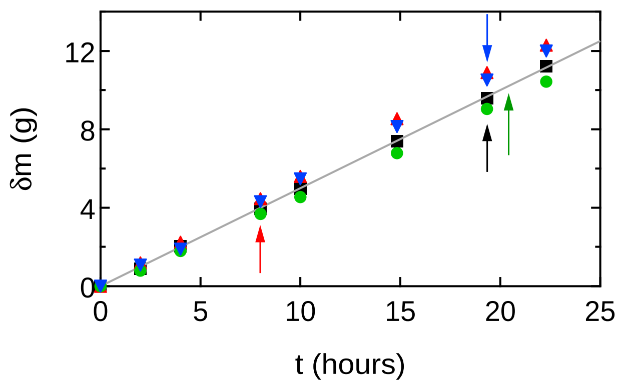

Fig. 2 (Color online) Mass loss $\delta m \equiv m(t=0) - m(t)$ vs. time t for four different plates taken from three different batches (●,▲,▼,■). The gray line is the best linear fit over six data sets (two are not shown on the graph for the sake of clarity) with a slope: $\delta\dot{m} = 0.50 \pm 0.02$ g/hour. Values obtained at other temperatures are given in table I in the main text. The arrows indicate the detachment time t^* of the gels from the sidewall of the plate.

Supplemental figure 2 illustrates the water loss quantified by $\delta m \equiv m(t=0) - m(t)$ for plates maintained in the thermoregulated chamber at $T = 20°$C. The mass loss increases linearly with time and is not modified by the detachment of the gel. The water-loss rate increases for increasing temperature as reported in table I in the main text.

Supplemental figure 3 illustrates the evolution of the panoramic 360° sideview of an agar plate from the early stage of syneresis up to the detachment. The gel thickness e decreases roughly linearly in time in agreement with the mass loss, while the thickness heterogeneity $\delta e = e_{min} - e_{max}$ remains about constant during the gel thinning (blue and red dashed lines in figure 3). The latter result suggests that the contact area between gel and sidewall, along the whole thickness of the gel (and not particularly along the gel asymetry δe) is at stake in the building up of stresses that trigger gel micro-displacements. A few hours before gel detachment, red segment lines in figure 3 further indicate a more rapid gel thinning in the area of minimum

* Note that to make sure that time correlation spectroscopy experiments are performed on gels presenting the same mass and thickness in Fig. 1(a) and (b), the gel in the glass dish was prepared in the Lab from a powder provided by BioMérieux – the same powder that is used to prepare the commercial plates otherwise used in this work and in figure 1(a) and (c). The powder is mixed with deionized water and brought to a boil for 15 min. The hot mixture is then poured into the glass dish and left to cool down at ambiant temperature.

thickness where the growth of a lens shaped meniscus finally leads to sudden gel detachment (last image in figure 3). See also figure 6(e) in the main text.

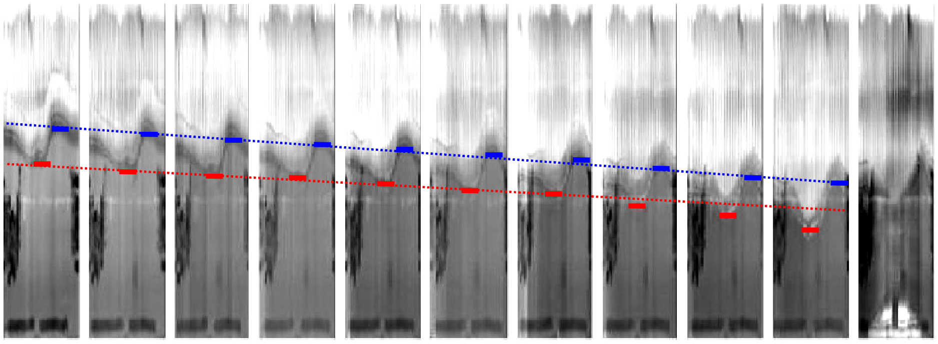

Fig. 3 Evolution of the 360° sideview of a plate during the syneresis process of a plate placed at rest in a thermoregulated chamber (T=25°C). The first image corresponds to $t = 0$, and two successive images are separated by $\Delta t = 1$ h. The gel detachment occurs after 9.5 hours, between the last two images. Blue and red segment lines respectively show the time location of the areas of maximal and minimal thickness (blue and red dotted lines are guides for the eye). The initial characteristics of the plate are $e_{min} = 3.6$ g, $\delta e = 0.7$ mm and $m = 22.6$ g.

Supplemental figure 4 displays the lag-time temporal diagram of the intensity correlation function $g_2^{*\perp}(t,\tau)$, obtained in the perpendicular configuration (see section 2.3 in the main text) for a gel that has been carefully detached from the sidewall of the dish before the start of the experiment by means of a cutter blade. This experiment confirms that the second part of the lag-time temporal diagram reported in figure 7(a) in the main text corresponds to the dynamics of a gel that has detached from the sidewall of the dish.

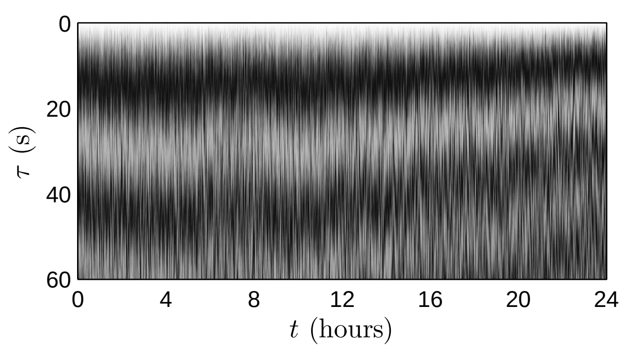

Fig. 4 Lag-time temporal diagram of the intensity correlation function $g_2^{*\perp}(t,\tau)$, as a function of the lag time τ and the experimental time t. TRC experiments is performed with crossed polarizers and a gel that has been minutely detached from the sidewall of the dish by means of a cutter blade, shortly before the start of the speckle pattern acquisition. The dynamics is very similar to the one reported in figure 7(a) for $t > t^*$ on a standard gel, after the gel has detached.

Supplemental figure 5 shows for three different plates the intensity correlation function $\langle g_2^{*\perp}(t,\tau)\rangle_t$ computed in perpendicular configuration during the early stage of the syneresis, and averaged over the following time interval: 20 min$< t <$ 140 min - the same as in figure 8 and 9 of the main text. The correlation function decreases as an exponential for $\tau \leq 30$ s, whereas it displays a streched behavior for $\tau \geq 30$ s which can be attributed to the superposition of several phenomena: (*i*) the gel thermal motion, (*ii*) the micro-displacements of the gel inside the dish while the gel thins but remains macroscopically in contact with the sidewall, and (*iii*) local changes in the gel surface topography or in the orientation of the air/gel interface induced by the gel micro-displacements.

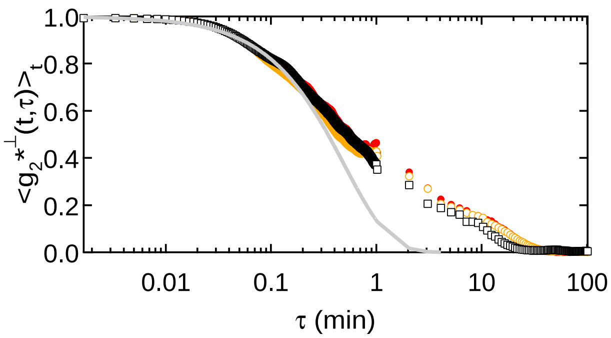

Fig. 5 (Color online) Averaged correlation function $\langle g_2^{*\perp}(t,\tau)\rangle_t$ vs. τ for three different plates (same symbols as in fig. 8 in the main text). The gray line corresponds to a decreasing exponential function over a characteristic timescale τ_0=30 s. Note that here, $g_2^*(t,\tau)$ is computed at the maximum frame rate of 10 Hz over the lag time $\tau = 1$ min, while for $\tau > 1$ min, $g_2^*(t,\tau)$ is only computed every minute.