Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information:

Controlling Deformations of Gel-based Composites by Electromagnetic Signals within GHz Frequency Range

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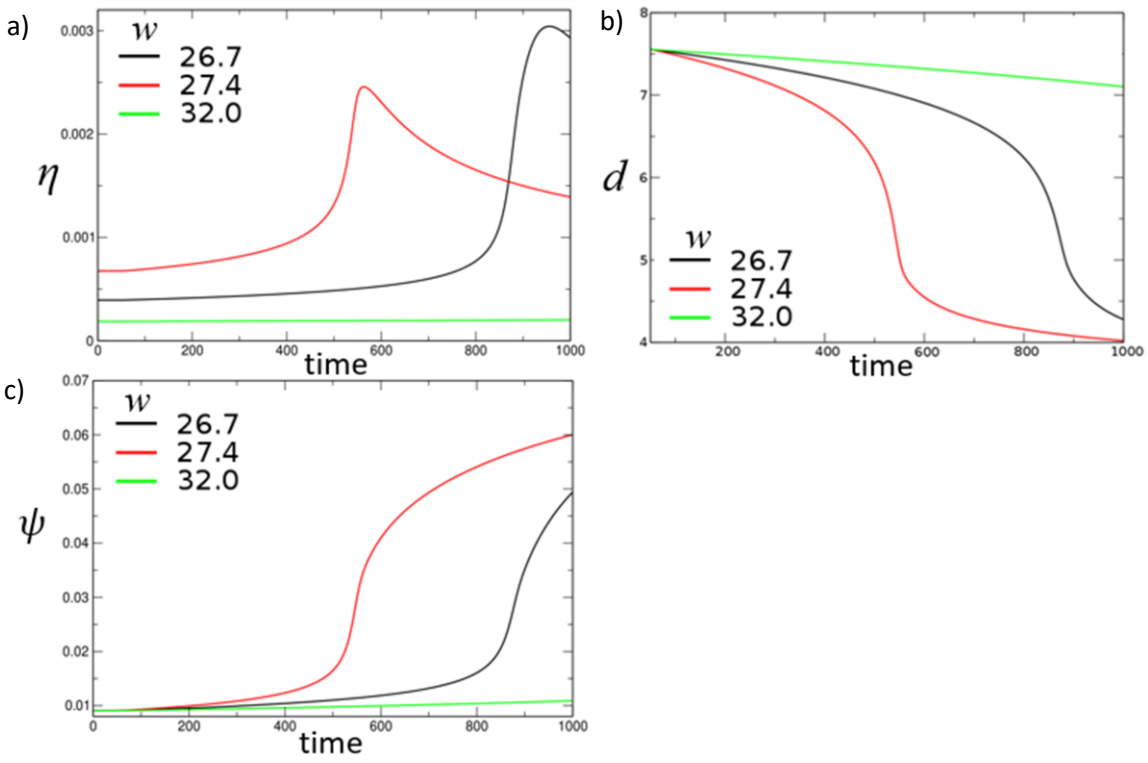

Fig. S1 a) Absorption coefficient η as a function of time for the three normalized frequencies as given in the legend. **b)** Evolution of the thickness *d* for the simulation runs in a). **c)** The time evolution of the volume fraction of nanoparticles, ψ, for the same simulation runs.

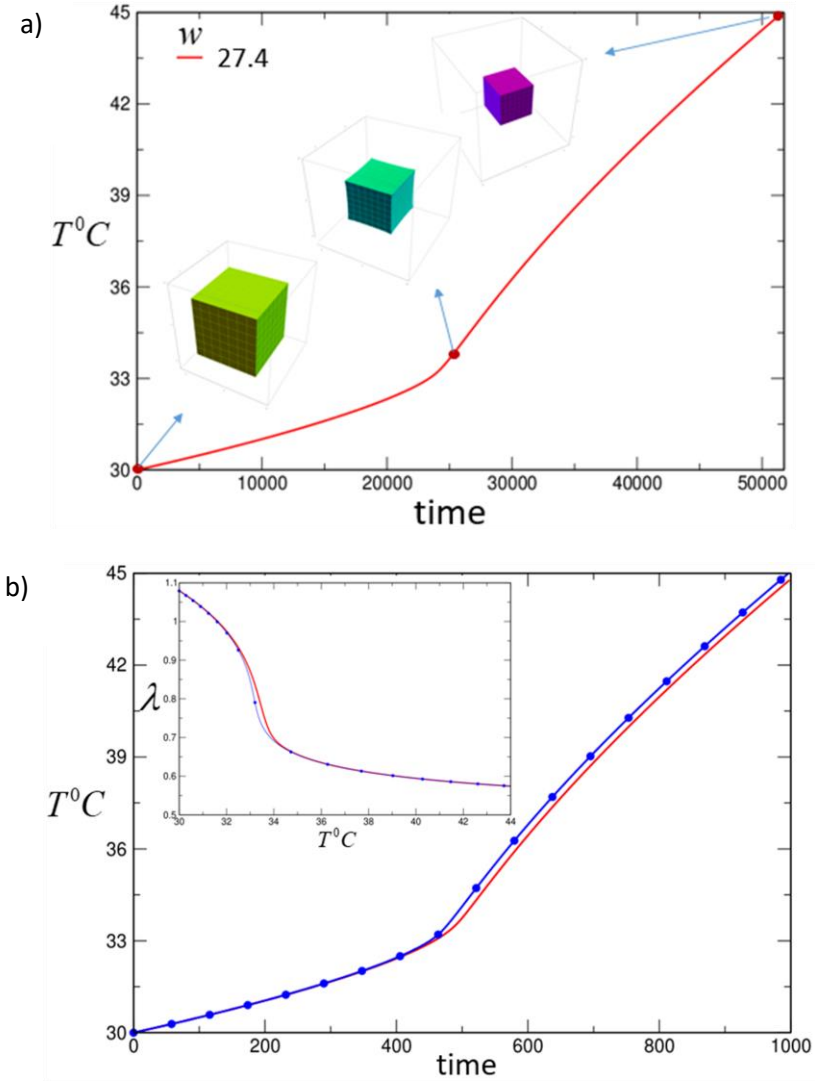

Fig. S2 a) The FMR heating at the reduced power density, corresponding to P_0^*=9.988 W/m^2. The rest of the simulation parameters are the same as in the red curve of Fig. 2 (a). **b)** Both curves (red curve in Fig. 2a and the curve in a) overlap if the time in a) is scaled by P_0/P_0^*=51.81, where P_0=517.50 W/m^2 is the reference value of the power density in our system. Inset shows the same scaling for these two values of P_0 for the degree of swelling λ as a function of temperature. Here, the red curves correspond to the simulation in Fig. 2(a), and the blue dotted curves corresponds to the data in Fig. S2 with the time scaled by P_0/P_0^*.

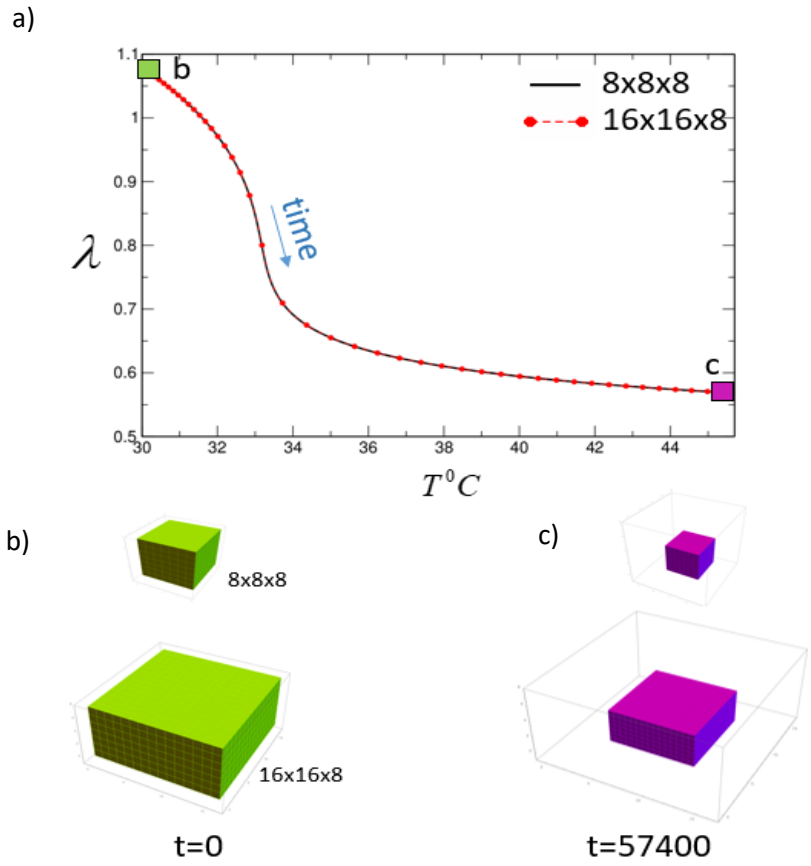

Fig. S3 An effect of varying lateral dimension of the sample while keeping the thickness *d* constant. In **a)**, the black curve corresponds to the same simulation run as shown in Fig. S2a above (sample size 8x8x8 nodes , which corresponds to the dimensional initial size 5.3 μm x 5.3 μm x 5.3 μm) , and the curve marked by the red dots corresponds to the simulation with the same parameters but with the sample size of 16x16x8 nodes (corresponding to 10.6 μm x 10.6 μm x 5.3 μm). The bottom nodes are allowed to slide along the horizontal plane, mimicking the film sliding along the surface. Blue arrow marks the direction of time, and the squares maked as b) and c) on the volume phase transition curves correspond to the initial and late time snapshots shown for both sample sizes in **b)** and **c)**, correspondingly.

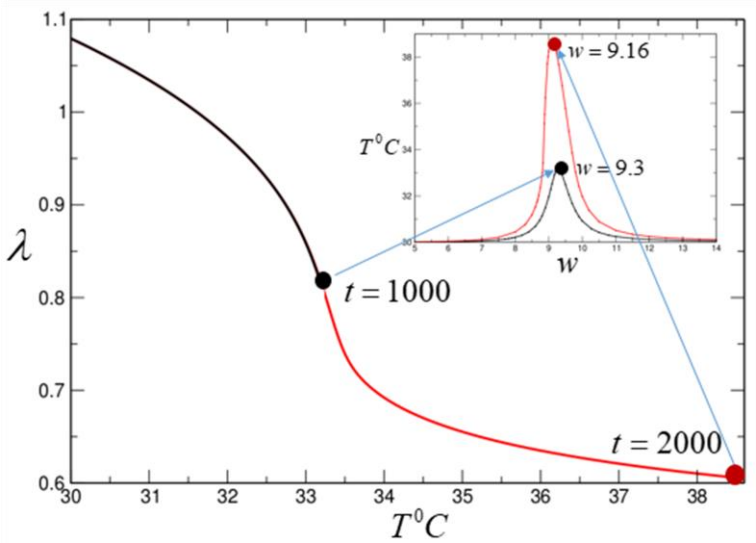

Fig. S4 The effect of duration of FMR heating on the degree of swelling of the Fe_3O_4–based composite. The black circle on the black curve represents the degree of swelling at the corresponding resonance frequency (w = 9.3) at the time t=10^3 , and the red circle on the red curve corresponds to the degree of swelling at the resonance frequency (w = 9.16) at the time t=2×10^3. The inset shows temperature as a function of an applied frequency w at t=10^3 (black curve) and t=2×10^3 (red curve).