Electronic Supplementary Material (ESI) for Nanoscale.

Temperature Analysis:

We simulate the raise of temperature in the graphene sheet induced by the laser pulses. We first used FDTD from Lumerical to estimate the absorption rate of power from the laser pulses. A graphene sheet with a diameter of 0.8 μm and a thickness of 5 nm in either water or NMP environment were used in the simulation. After we obtained the absorption rate of power from the laser pulse, we used COMSOL to find the heat transfer between the graphene sheet and surrounding liquid. The heat source was applied directly on the graphene sheet. We used experimental measured parameters for the density, heat capacity, and thermal conductivity in our simulation [1–5]. We assumed that the laser has an average power of 10 mW, a beam diameter of 30 μm, a pulse duration of 150 nm, and a repetition rate of 1 KHz. Figure S1 shows the raise of temperate for one laser pulse in either water or NMP environment. One can see that the temperature can raise to about 750 degree or 1900 degree for water or NMP environment, respectively. In either case, the peak temperature is well above the water and NMP boiling point to generate air bubbles.

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[3] Pop, E. (2012). Thermal properties of graphene: Fundamentals and applications. Graphene Fundamentals and Functionalities, 37(12), 1273–1281.

[4] Henni, A.;Hromek, J. J.;Tontiwachwuthikul, P.; Chakma, A. Volumetric properties and viscosities for aqueous N-methyl-2-pyrrolidone solutions from 25 C to 70 C. *Journal of Chemical &Engineering Data* **2004**, *49*, 231-234.

[5] Reddy, K. R.;Kumar, D. B. K.;Rao, G. S.;Anila, P.; Rambabu, C. Densities, viscosities, sound speed, and IR studies of N-methyl-2-pyrrolidone with cyclohexylamine, cyclohexanol, and cyclohexene at different temperatures. *Thermochimica Acta* **2014**, *590*, 116-126.

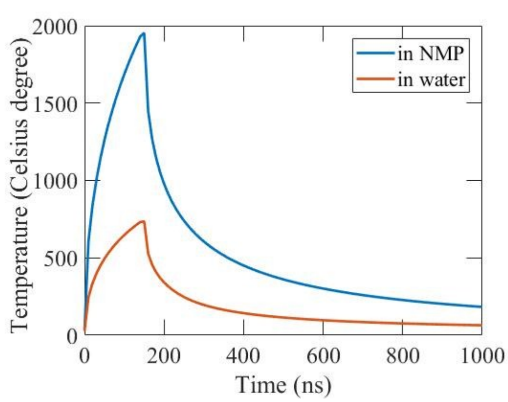

Figure S1. Temperature evolution of a graphene sheet under excitation of a 150-ns laser pulse.

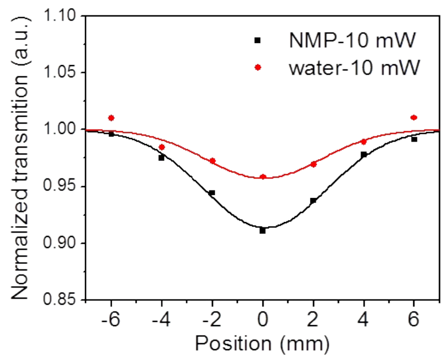

Figure S2. Optical limiting Z-scan of graphene dispersion in water and NMP.

Transmission Analysis:

Here, we use FDTD to obtain the transmission of light through bubble. We assume a graphene sheet with a diameter of 0.8 μm and a thickness of 5 nm, which is located in the center of the bubble with different sizes. Figure S3 shows the transmission as a function of bubble size with and without a graphene sheet. For one bubble with a diameter of 5 um, the graphene sheet contributes to a reduction of transmission of 0.005 and the air bubble contributes to a transmission reduction of 0.04.

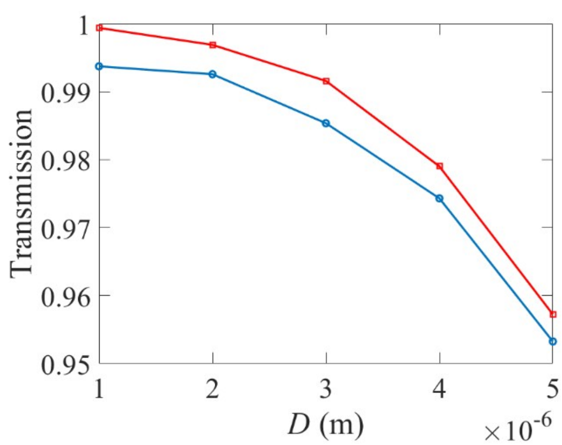

Fig. S3. Blue curve and red curve show transmission with and without graphene sheet, respectively.