

Microfluidic manufacturing of surface-functionalized graphene oxide nanoflakes for gene delivery

Riccardo Di Santo,¹ Luca Digiacomo,¹ Sara Palchetti,¹ Valentina Palmieri,² Giordano Perini,²
Daniela Pozzi,¹ Massimiliano Papi,^{2*} Giulio Caracciolo^{1*}

¹Department of Molecular Medicine, Sapienza University of Rome, Viale Regina Elena
291,00161, Rome, Italy

²Institute of Physics, Fondazione Policlinico Universitario A. Gemelli, IRCCS - Università
Cattolica del Sacro Cuore, Rome, (IT)

* giulio.caracciolo@uniroma1.it; massimiliano.papi@unicatt.it

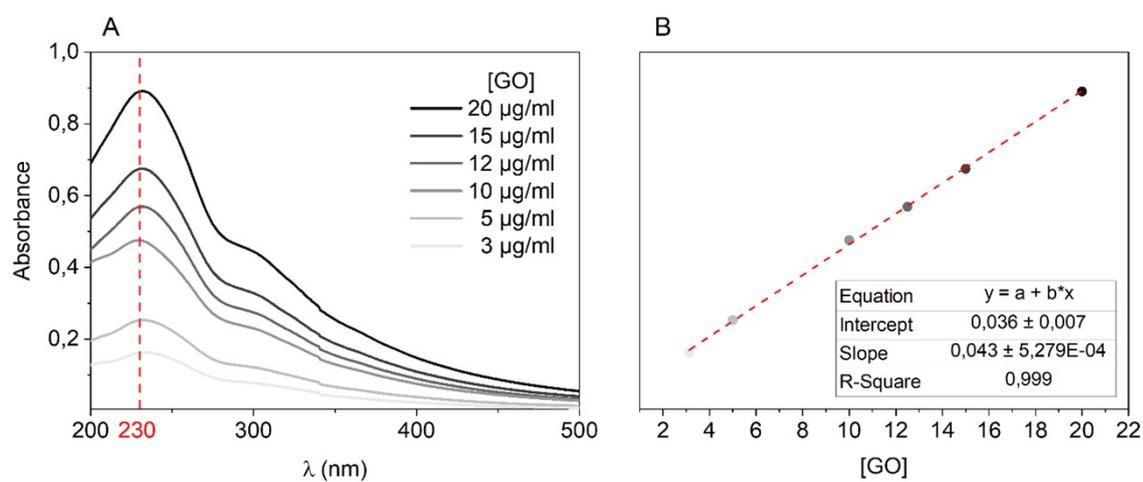


Figure S1: UV-Vis spectra measurements of Graphene Oxide (GO) nanosheets. A series of absorbance spectra at known GO concentrations was collected (A). Absorbance values at 230 nm, linear fitting curve (red dashed line), and fit parameters (B) of the calibration curve.

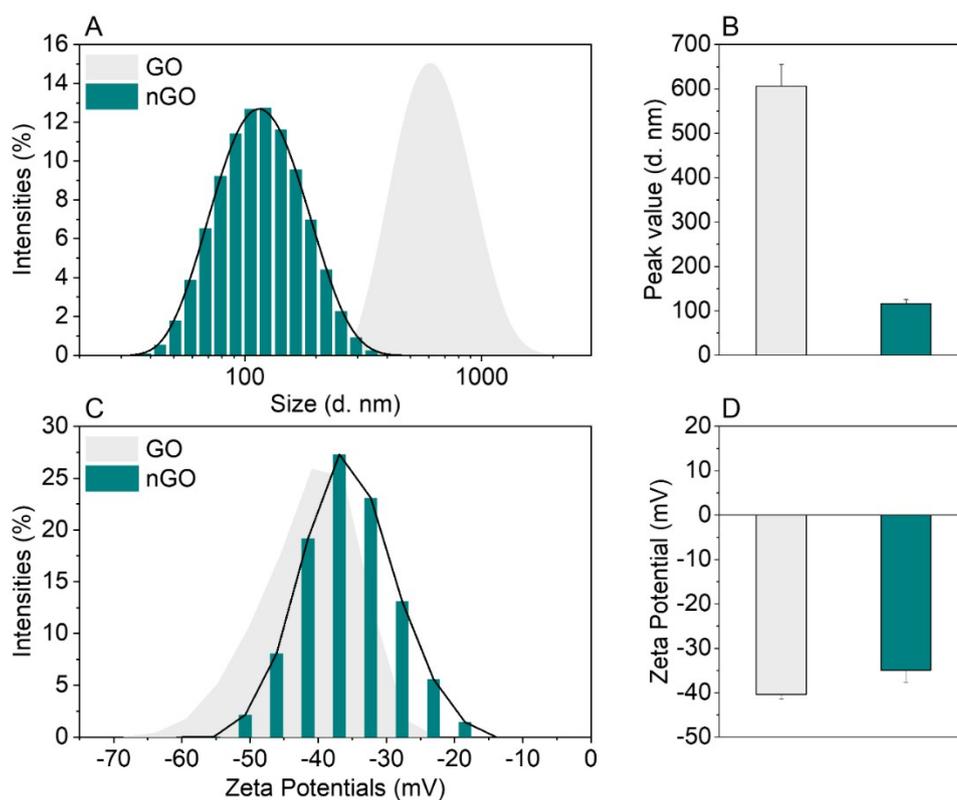


Figure S2: DLS measurements of Graphene Oxide (GO) and nanosized Graphene Oxide (nGO). Intensity-weighted size distributions and the relative peak values are reported, respectively, in A and B. Surface charge properties are assessed by zeta potentials distributions (C) and mean value (D).

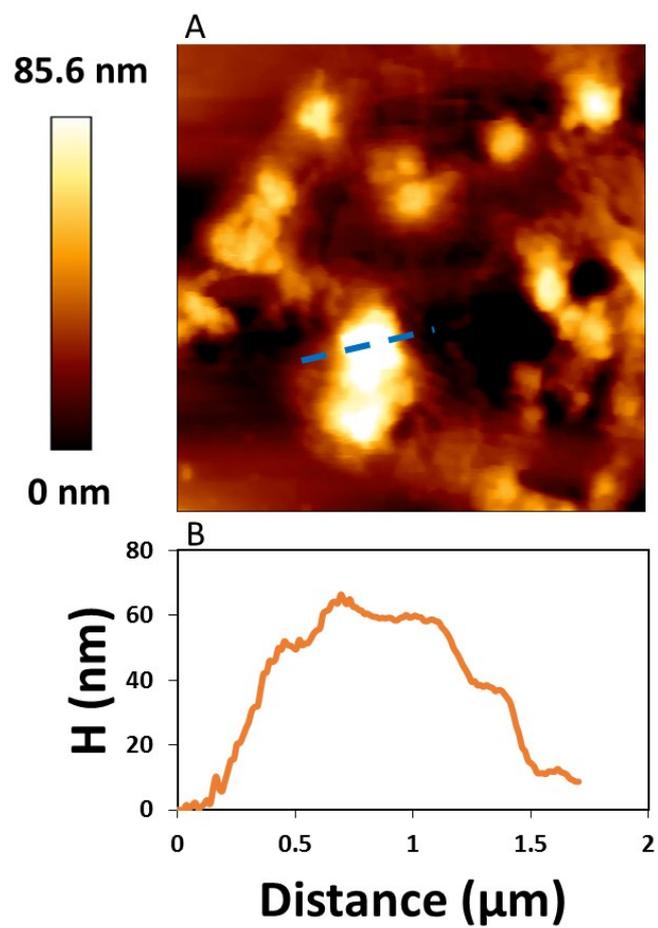


Figure S3: Representative AFM image (A) and AFM height profile (B) of coated nGO with DOTAP CLs by bulk mixing.

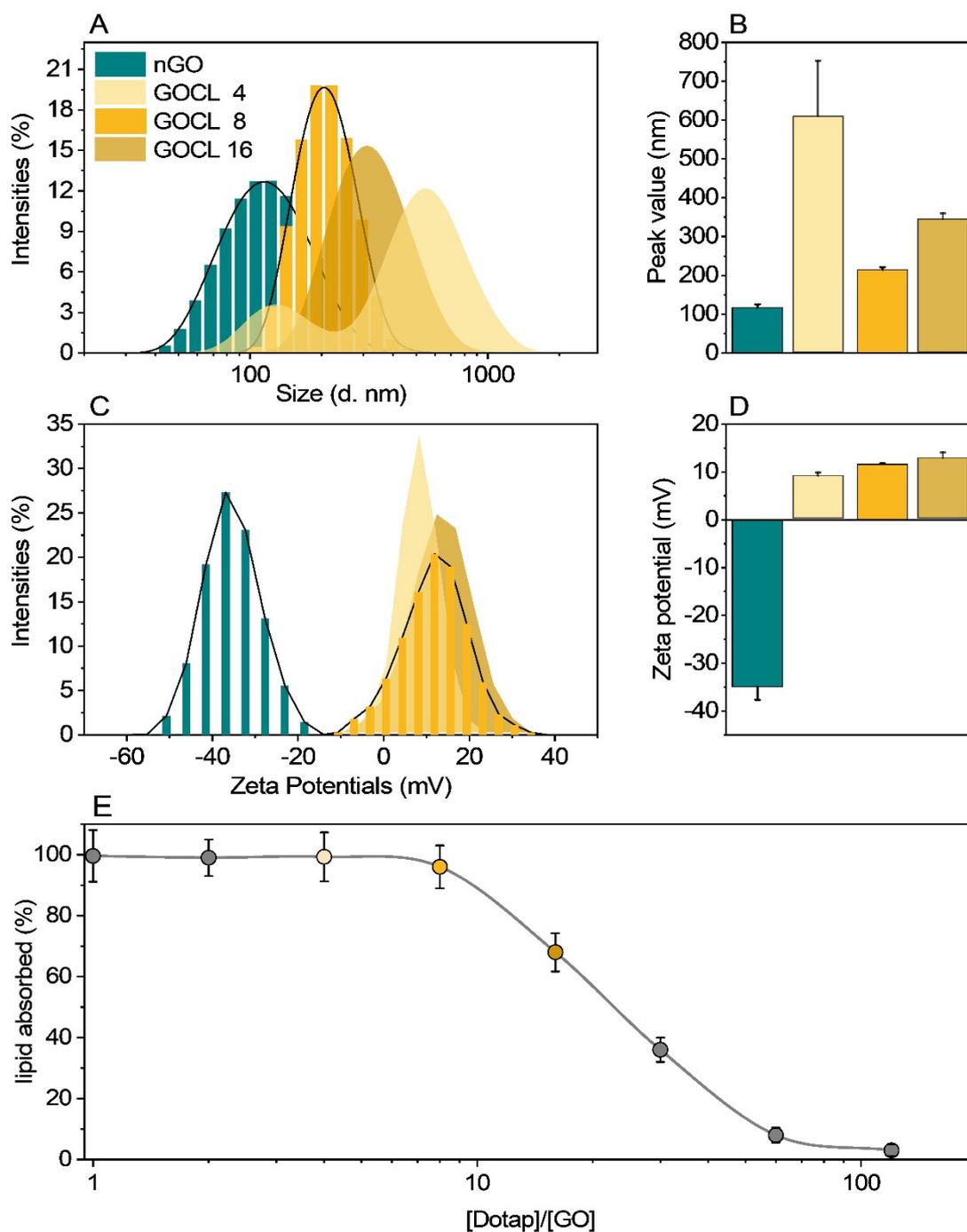


Figure S4: DLS measurements of nanosized Graphene Oxide (nGO) and Graphene Oxide Cationic Lipids nanoparticle (GOCL) at different DOTAP/nGO molar ratio (4, 8, 16). Intensity-weighted size distributions of each species and the relative peak values are reported, respectively, in A and B. Zeta potentials distributions (C) and mean value (D) are also evaluated. Quantification of the DOTAP adsorption capacity of GO vs DOTAP/GO weight ratio (E).

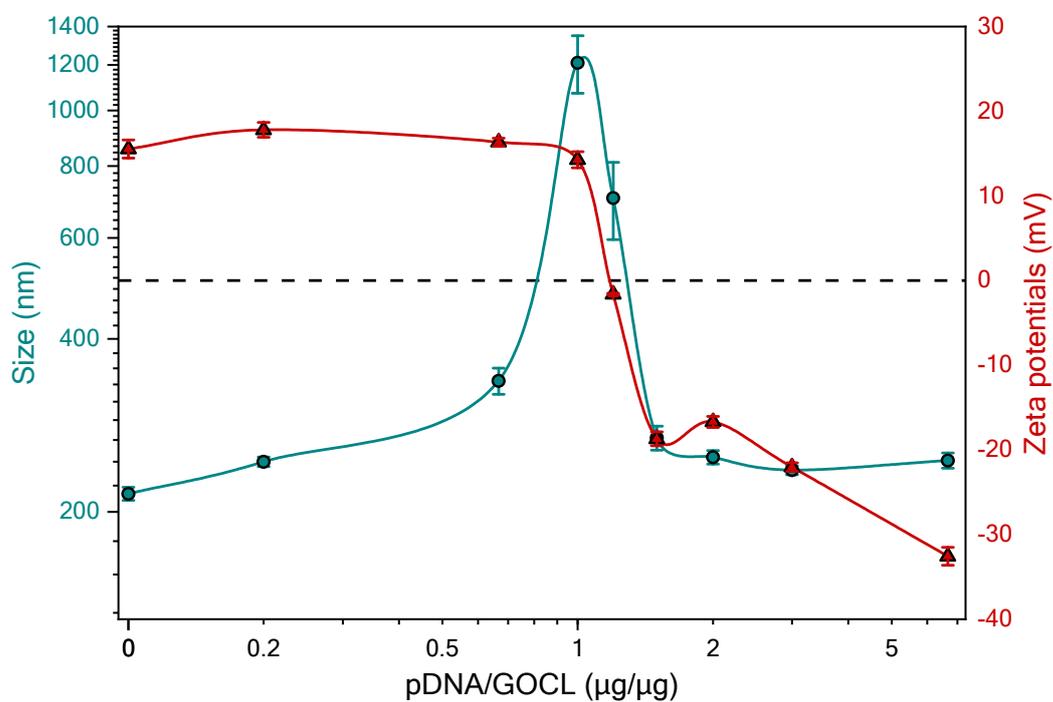


Figure S5. Size (green circles) and Zeta-potential (red triangles) of complexes arising from bulk mixing of nanosized graphene oxide cationic lipids nanoparticle (GOCL) and pDNA at different pDNA/GOCL ratio. At pDNA/GOCL <1, excess cationic lipid charge led to positively charged complexes that undergo charge inversion at pDNA/GOCL \approx 1. Around the isoelectric point short-range Van der Waals attraction dominate over electrostatic repulsion with the result that large clusters form.