Shear rheology of graphene oxide dispersions

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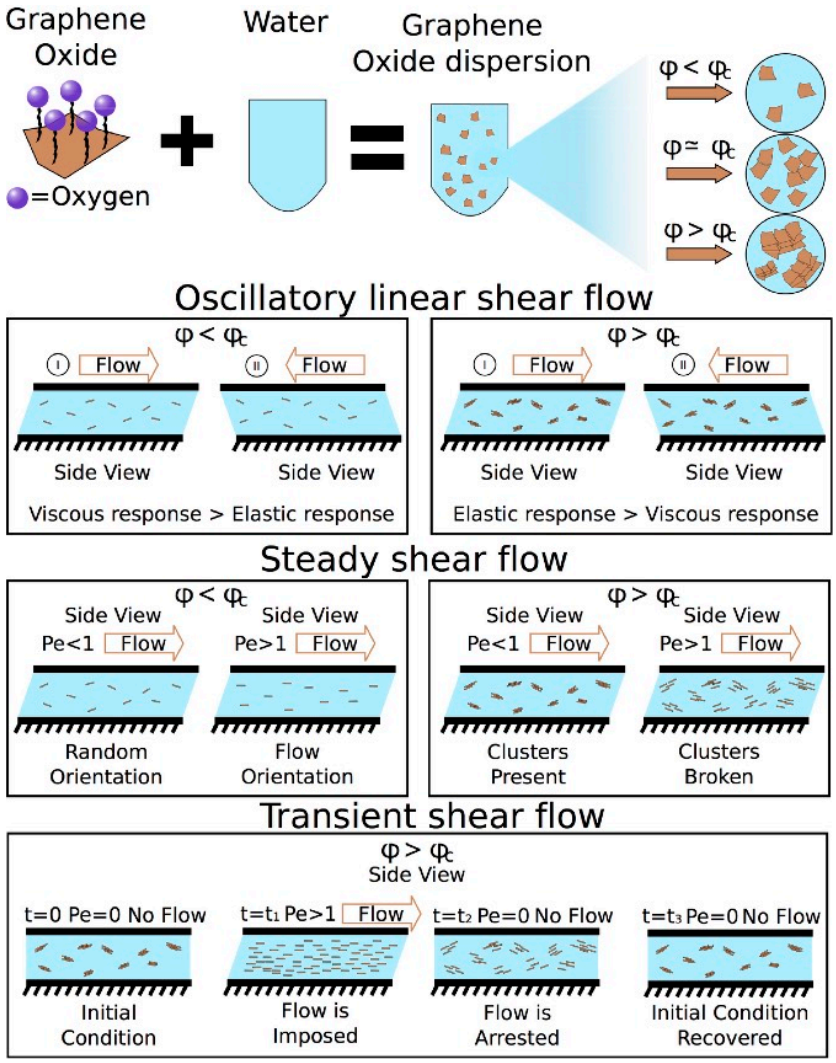
Graphene oxide (G-O) is a chemically oxidized sheet of graphene. Owing to their functional groups, G-O sheets have found numerous applications in biomedical, electrical and material engineering. The flow properties of G-O dispersions, that is, the rheology, are intimately related to the material processing and design of G-O based composites.

Reference:

F. Del Giudice, an A. Q. Shen, Current Opinion in Chemical Engineering, 16, 23-30, 2017



G-O aqueous dispersions at different volume concentrations f are prepared by adding G-O in water. ***Oscillatory linear shear flow:*** *When $\phi < \phi_C$ (ϕ_C is the critical volume or mass concentration) viscous response due to the drag of the G-O sheets prevails over the elastic response. When $\phi > \phi_C$ elastic response due to the G-O self-aggregation prevails over the viscous response due to the drag of the clusters.* ***Steady shear flow****: When $\phi < \phi_C$ and at Peclet number Pe>1, G-O sheets are randomly oriented; while at Pe > 1 G-O sheets are oriented along the flow direction. When $\phi > \phi_C$ and at Pe < 1, G-O are arranged in randomly oriented clusters; while at Pe > 1 clusters are broken down.* ***Transient shear flow:*** *Only the case $f > f_C$ is considered. Initially, the dispersion is arranged in randomly oriented clusters. After applying a flow at Pe > 1, clusters are broken down and G-O sheets are oriented along the flow direction. When the flow is arrested, Pe = 0, G-O sheets start to self-arrange. After sufficient resting time, G-O sheets recover the initial cluster configuration.*