

Figure 1. FTIR spectra of Sodium alginate (Na Alg), (A) Calcium alginate (Ca Alg) and its composites with various fractions of reduced graphene oxide (rGO) as well as (B) Barium alginate (Ba Alg) and its composites with various fractions of reduced graphene oxide (rGO). The spectra of each sample has been normalized and shifted upwards.

Figure 2. Water sorption isotherms at 20°C of (A) Sodium alginate-graphene oxide composites, (B) Calcium alginate-reduced graphene oxide composites, and (C) Barium alginate-reduced graphene oxide composites. a_w indicates water activity or relative humidity. Please, note different ordinate scale bar of graphs (B)-(C). Dashed lines serve as guides to the eye only.

Figure 3. Water mass uptake versus sorption time graphs at 60°C for (A) Sodium alginate-graphene oxide composites, (B) Calcium alginate-reduced graphene oxide composites and (C) Barium alginate-reduced graphene oxide composites.

Figure 4. Water mass uptake versus sorption time graphs of Sodium alginate with various weight fractions of glycerol at (A) 20°C. Figure (B) illustrates the degree of swelling at 20°C of Sodium alginate with different weight fractions of glycerol. Dashed lines serve as a guide for eye.

Figure 5. Representative moisture absorption versus scaled time curves taken at 20°C and $a_w=0.8$ of (A) Sodium alginate-graphene oxide composites, (B) Calcium alginate-reduced graphene oxide composites and (C) Barium alginate-reduced graphene oxide composites

Figure 6. Estimated water diffusion coefficient values in Sodium alginate-graphene oxide composites of various compositions (wt% GO), and varying water activities at (A) 20°C and (B) at 60°C. Note that the ordinate values for graphs (A) and (B) are not equal.

Figure 7. Diffusion Deborah number values in Sodium alginate-graphene oxide composites at (A) 20°C and (B) 60°C. Dashed lines serve as guides to the eye only.

Figure 8. Estimated diffusion coefficient values for Calcium alginate-reduced graphene oxide (Ca-Alg/rGO) composites of various compositions, and varying water activities at (A) 20°C and (B) at 60°C. Note that the ordinate values for graphs (A) and (B) are not equal.

Figure 9. Diffusion Deborah number values in Calcium alginate-reduced graphene oxide composites at (A) 20°C and (B) 60°C. Dashed lines serve as guides to the eye only.

Figure 10. Estimated diffusion coefficient values in Barium alginate-reduced graphene oxide (Ba-Alg/rGO) composites of various compositions, and varying water activities at (A) 20°C and (B) at 60°C. Note that the ordinate values for graphs (A) and (B) are not equal.

Figure 11. Diffusion Deborah number values in Barium alginate-reduced graphene oxide composites at (A) 20°C and (B) 60°C. Dashed lines serve as guides to the eye only.

Figure 12. (A) Predicted relative diffusivity in Sodium alginate-graphene oxide composites depending on the aspect ratio of graphene oxide sheets and filler volume fraction. The inset graph shows a order parameter $\langle P_2 \rangle$ as a function of graphene oxide concentration. (B) Tapping mode AFM image (bottom) of GO sheets on silica substrate prepared from 0.05 wt% aqueous GO dispersion. The above picture represents height profile of the corresponding line.