

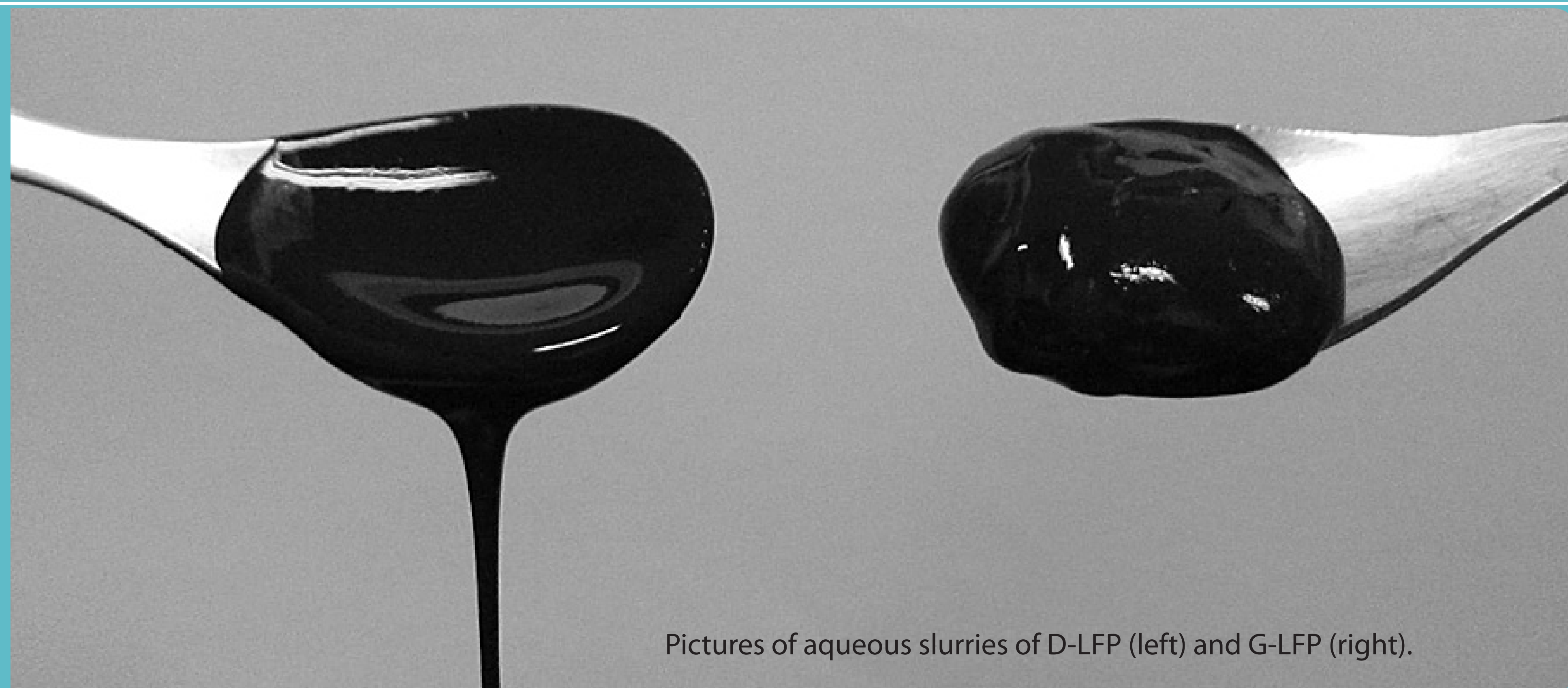
Gelation or dispersion of LiFePO₄ in water-based slurry?

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A completely distinct flow behaviors of the slurries using two LFP powder with the same physicochemical properties were observed.

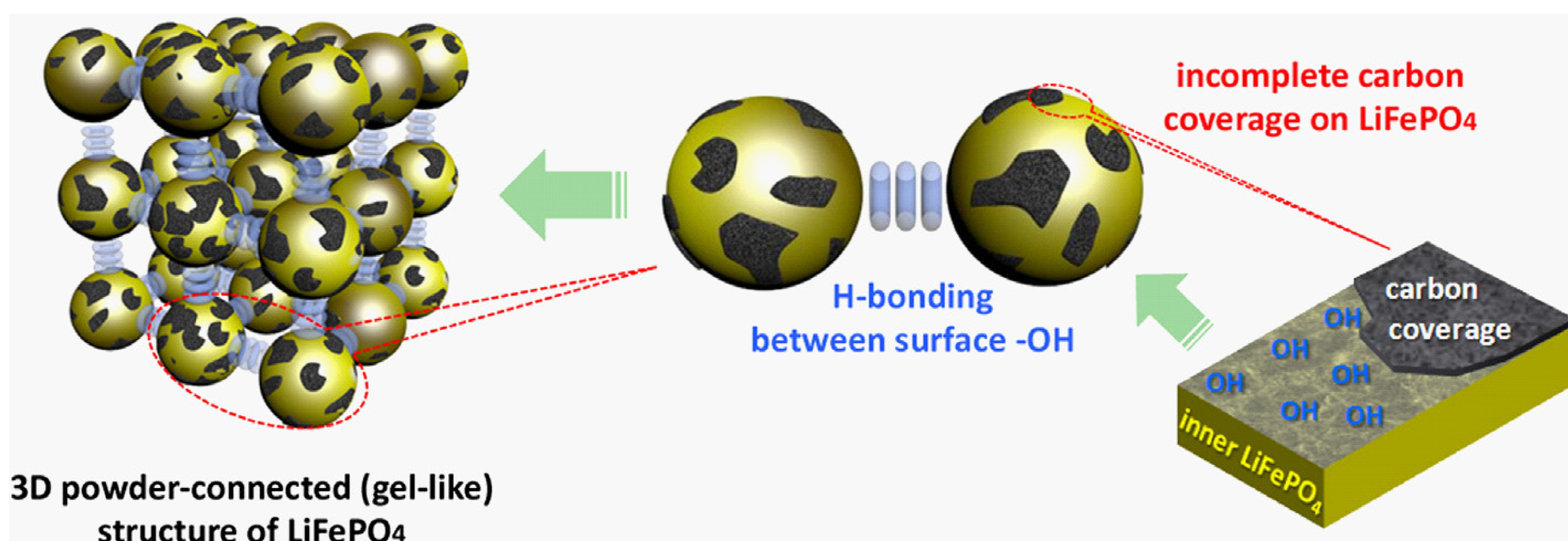
Discover the gelation phenomenon :



Pictures of aqueous slurries of D-LFP (left) and G-LFP (right).

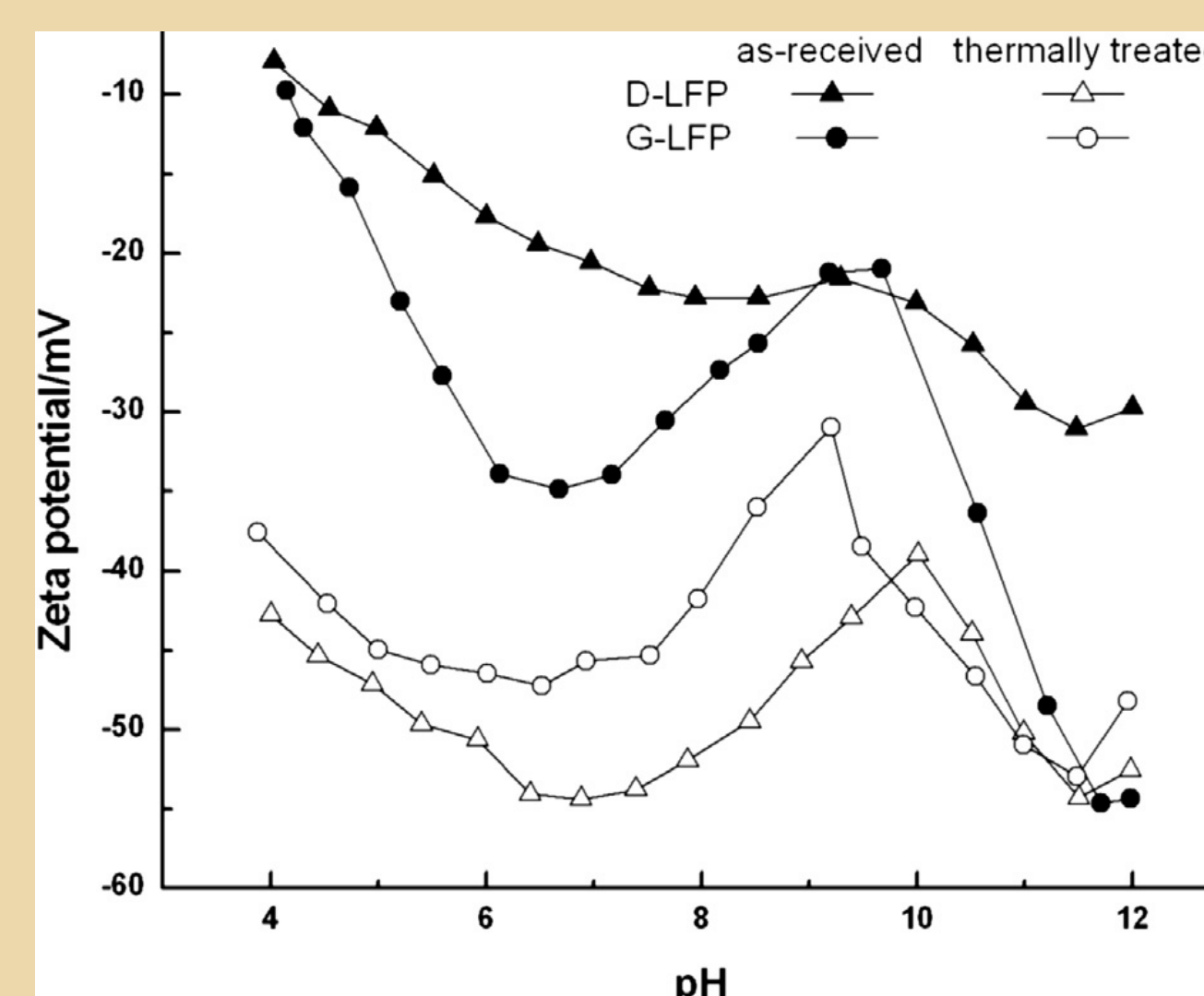
Gelation Mechanism :

Because the surface coverage of carbon on G-LFP is incomplete and thereby the inner LiFePO₄ is exposed, the can possibly contact each other via the H-bonding of surface-OH to form a 3D powder-connected (gel-like) structure.



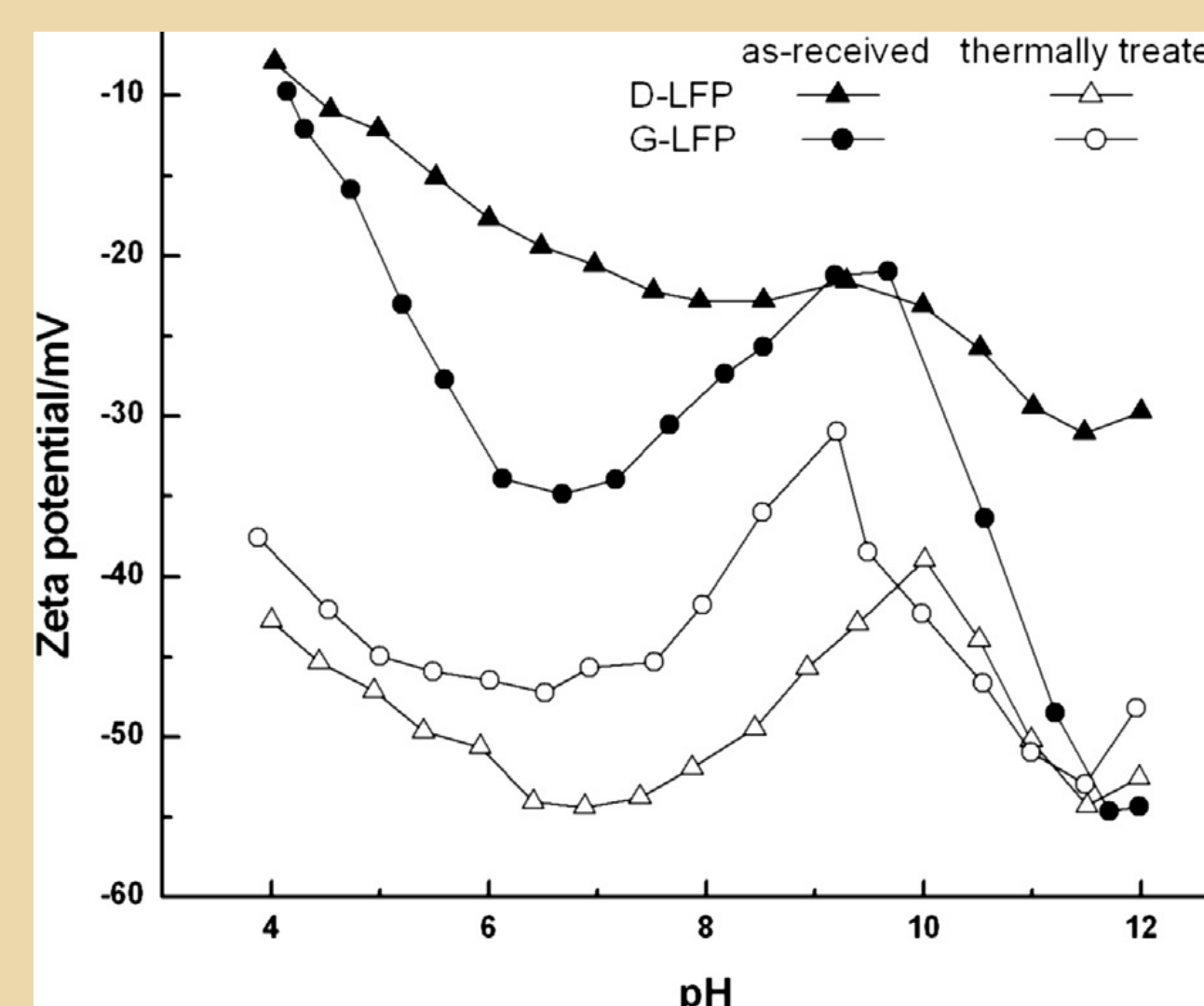
Experimental Data:

1. Zeta potentials as a function of pH for as-received and thermally treated D-LFP and G-LFP.



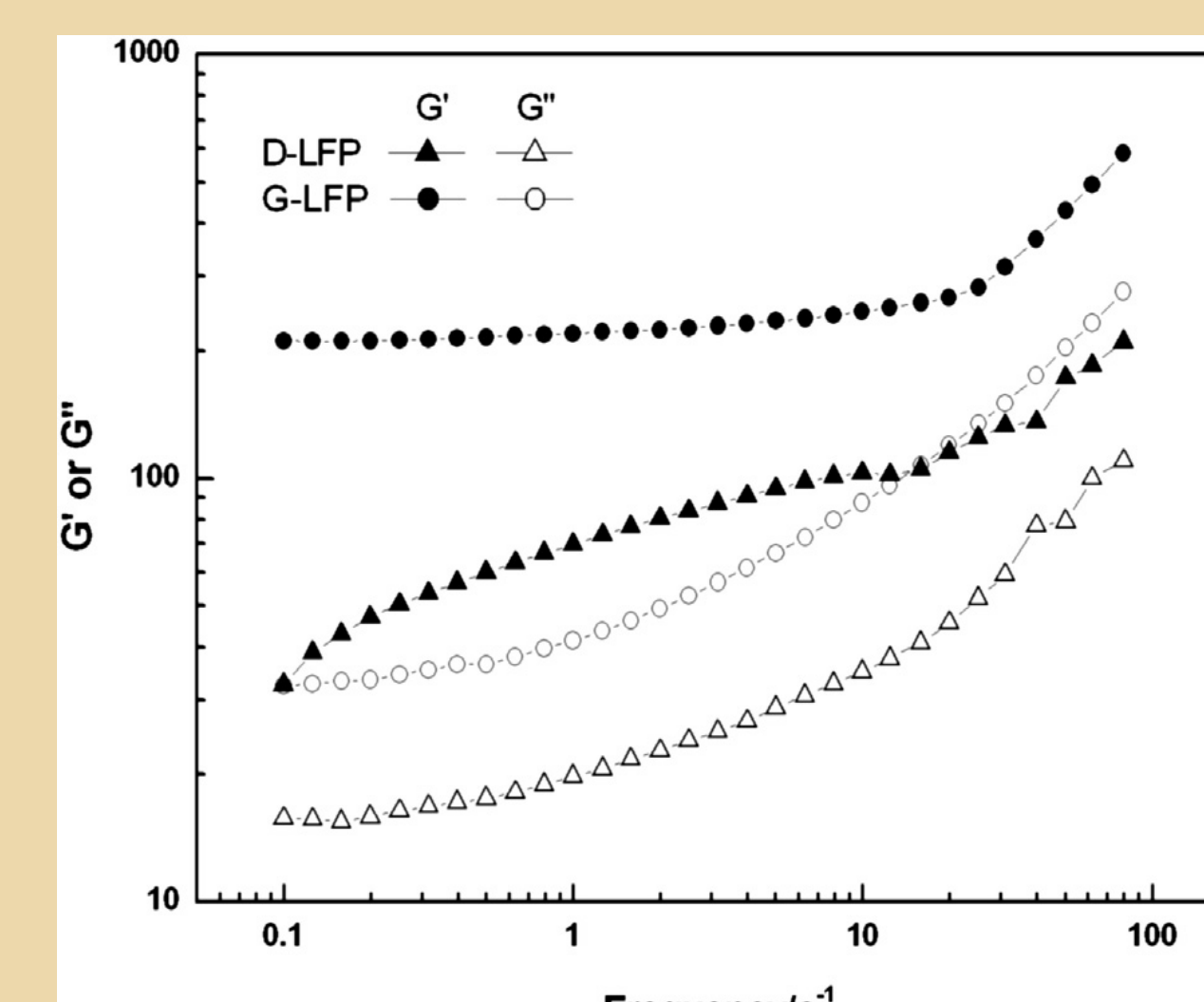
The zeta potential of the N-LFP exhibits less negative at lower pH levels, and increases with pH, while the G-LFP shows the variation of the zeta potential with pH is complicated. The carbon coverage on G-LFP should be incomplete, which causes the abnormality of the zeta potential.

2. FT-IR spectra of (a) D-LFP and (b) G-LFP.



The more significant CH and -OH features in the IR diagram suggest that more carbon defects appeared on G-LFP than on D-LFP. Therefore, it could show a greater amount of inner polar LiFePO₄ exposed to the particle surface of G-LFP than D-LFP.

3. G' and G'' as functions of sweeping frequencies for 64.1 wt% aqueous slurries of D-LFP and G-LFP



Both of D-LFP and G-LFP exhibit $G' > G''$; these results indicate a solid-like behavior. The several-fold increases in the G' and G'' of G-LFP compared to D-LFP suggests that the particle-particle interactions and the particle-fluid interactions are larger for the aqueous slurry of G-LFP.

Conclusion :

- The coverage of the surface carbon coating determines whether the gelation or the agglomeration of LiFePO₄ predominates
- The zeta potential results showed that even LiFePO₄ powders with the same chemical composition may have distinctly different qualities of carbon surface coatings, which affect the surface chemistry.
- The IR results showed that different exposures of LiFePO₄ lead to a great discrepancy in the quantity of surface-OH and C-H groups.
- The mechanism of the formation of a 3D gel-like structure of the LFP slurry was discovered, due to the exposed inner LiFePO₄.