

Enhancing the efficiency of pesticide application

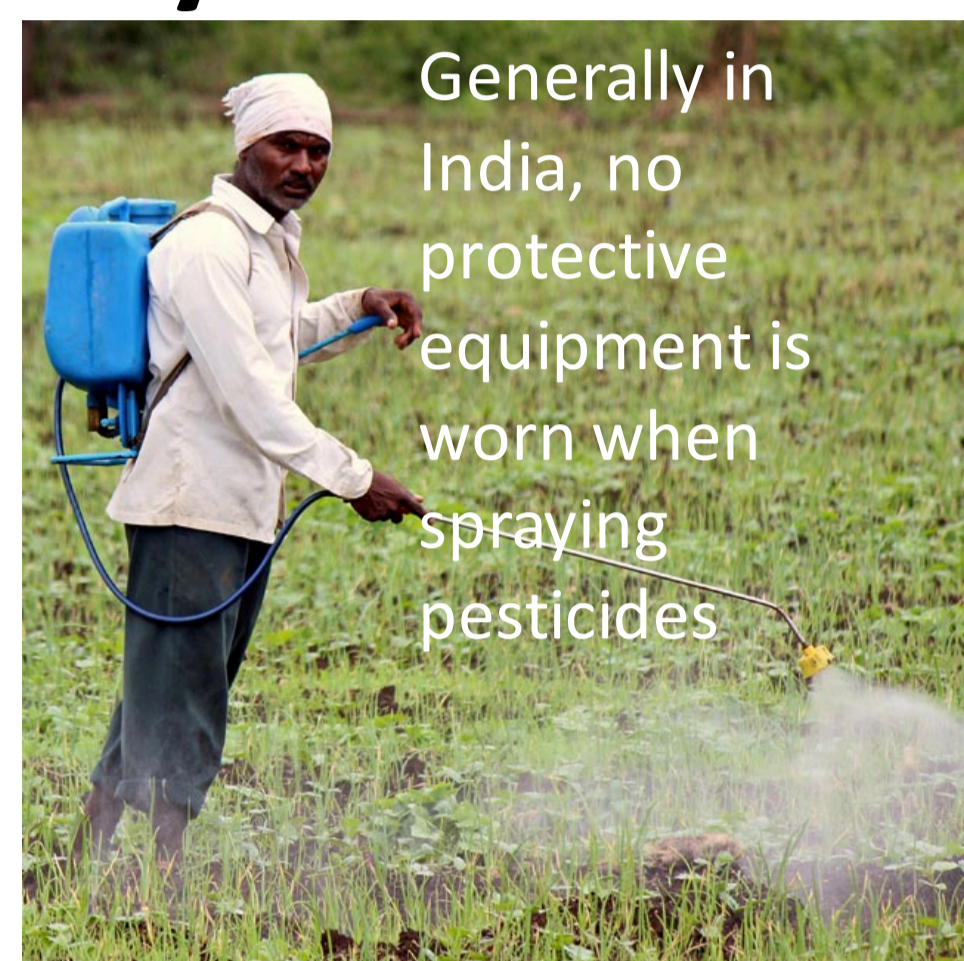
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Abstract and Opportunity

Pesticides are an essential input in agriculture. However, they are toxic and pollute the ecosystem. Here, we are **developing an additive that enhances pesticide application efficiency**, thereby reducing the needed quantity.

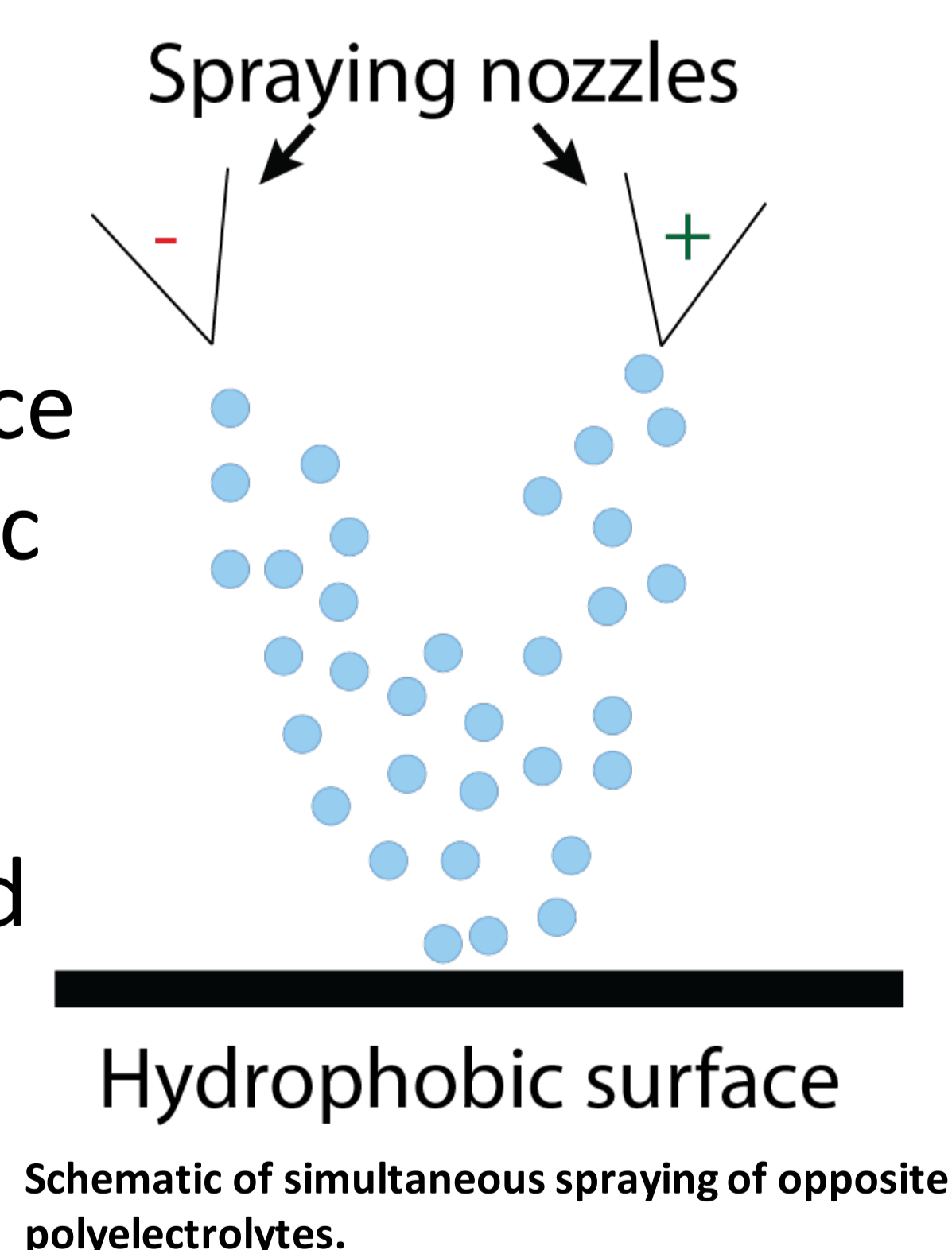


- Hydrophobic plants (i.e., wheat, onion, cabbage...) that repel sprayed pesticides are common
- Indian farmers can rarely afford expensive spraying equipment (i.e., electrostatic sprayers)

Proposed Solution

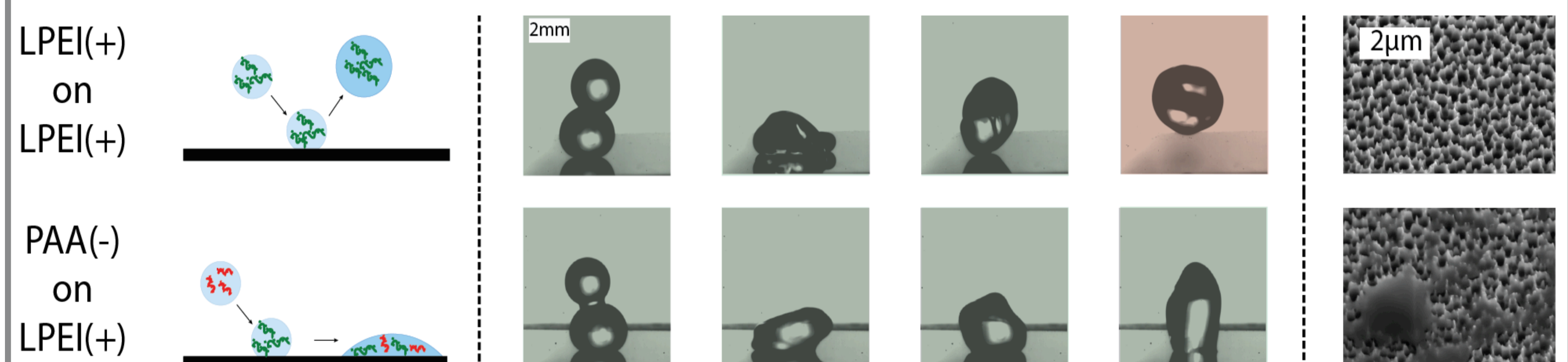
We add **oppositely charged polymers to two solutions of the liquid and spray them simultaneously**.

These polymers attract on the surface and form hydrophilic defects that pin the droplets, thereby enhancing the liquid retention.



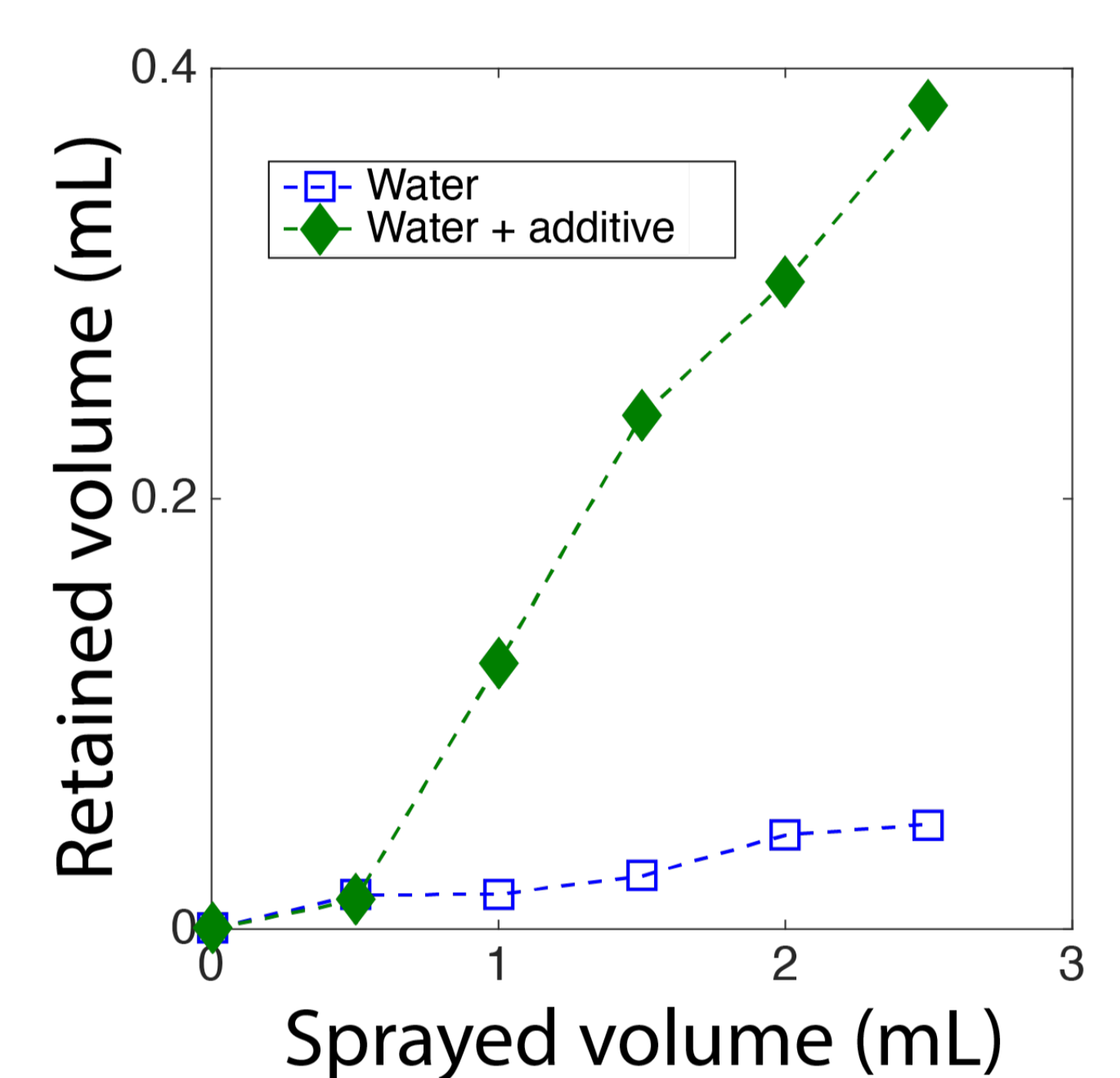
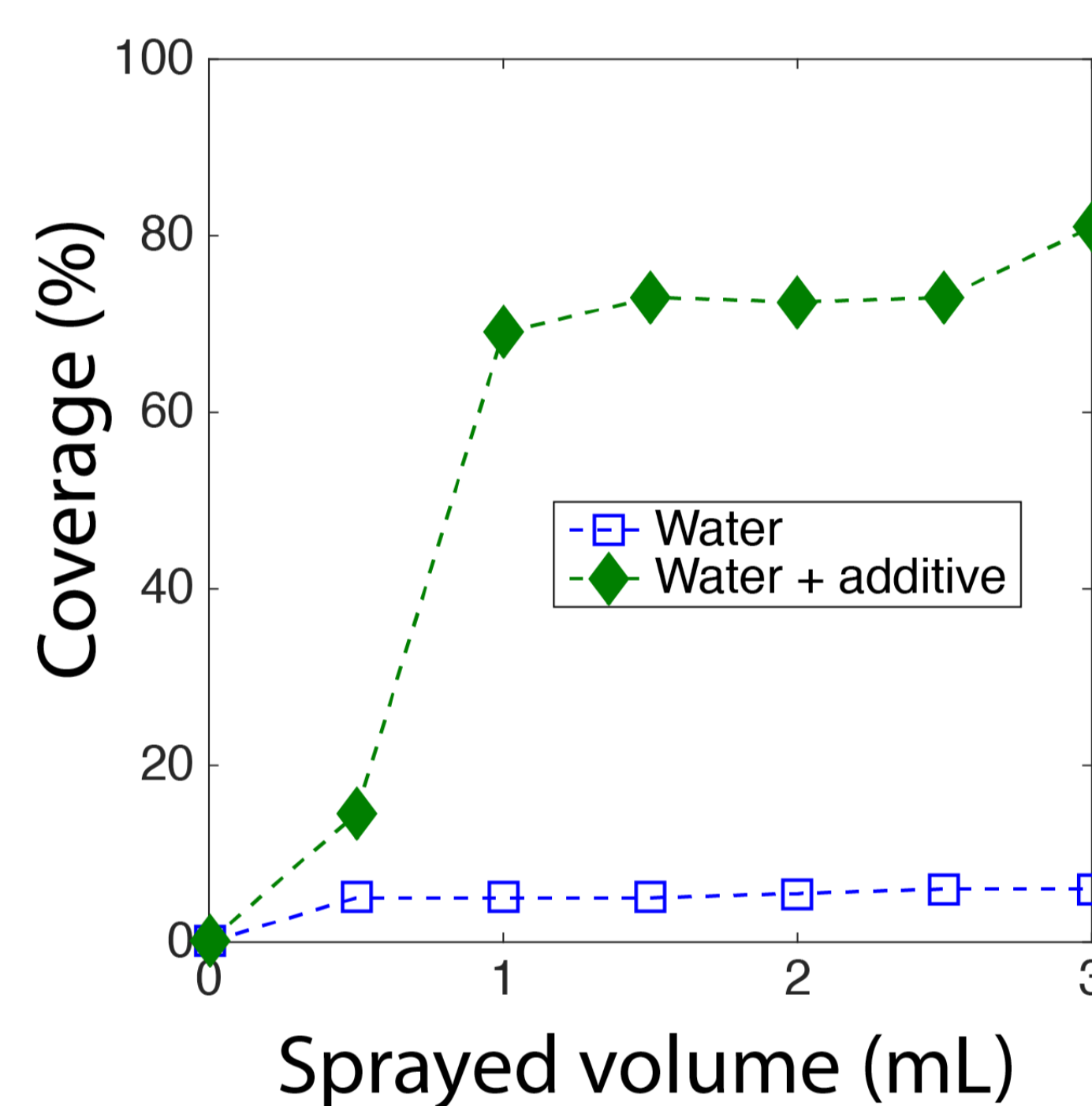
Results

- When droplets coalesce on the surface, charged polymers precipitate into surface hydrophilic defects. These defects exert a strong local pinning force on the droplet and prevent it from bouncing.



Drop-on-drop impacts with polyelectrolytes. The first column contains schematics of two possible scenarios. The next columns are snapshots of individual drop impacts for each of the previous scenarios. The rightmost column contains SEM images of the surface after impact.

- Transition from bouncing to sticking in drop impacts translates into a much higher macroscopic retention of sprays.



Surface coverage and retained volume for water and opposite polyelectrolytes spraying on a superhydrophobic surface.

Value Proposition

- Easy-to-use solution with no barrier to entry
- Tenfold increase in pesticide retention
- Reduction of production costs and environmental footprint

Acknowledgments

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TATA TRUSTS

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References

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De Rutter, H., Uffing, A. J., Meinen, E. & Prins, A. Influence of surfactants and plant species on leaf retention of spray solutions. *Weed Sci.* 567–572 (1990).