Investigating the Mechanical Stability and Photoluminescence Behavior Perovskite Films with Natural polymer Additives

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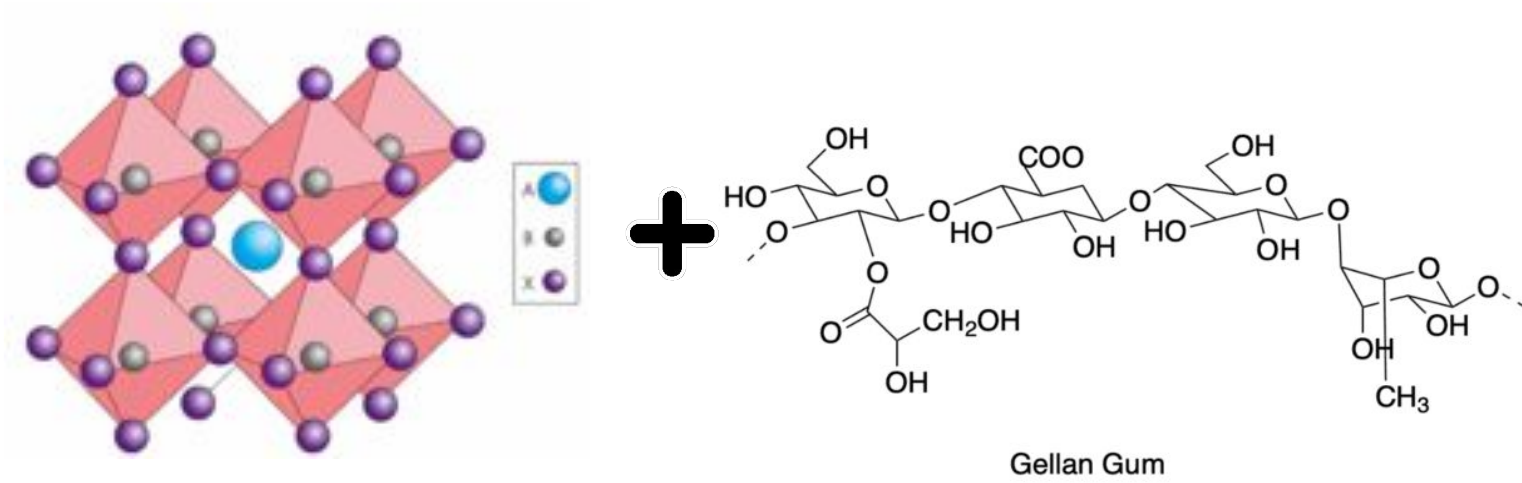
Background

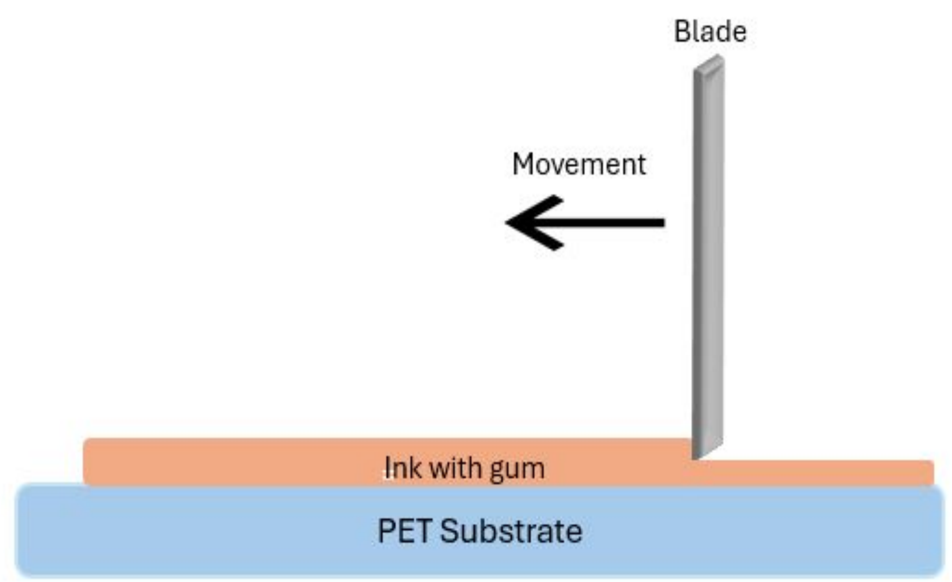
Perovskite solar cells are efficient and cost-effective, ideal for portable and flexible electronics where rigidity is a limitation. This research aims to enhance the flexibility and durability of these films on plastic substrates using natural polymer additives.



Perovskite Crystal structure

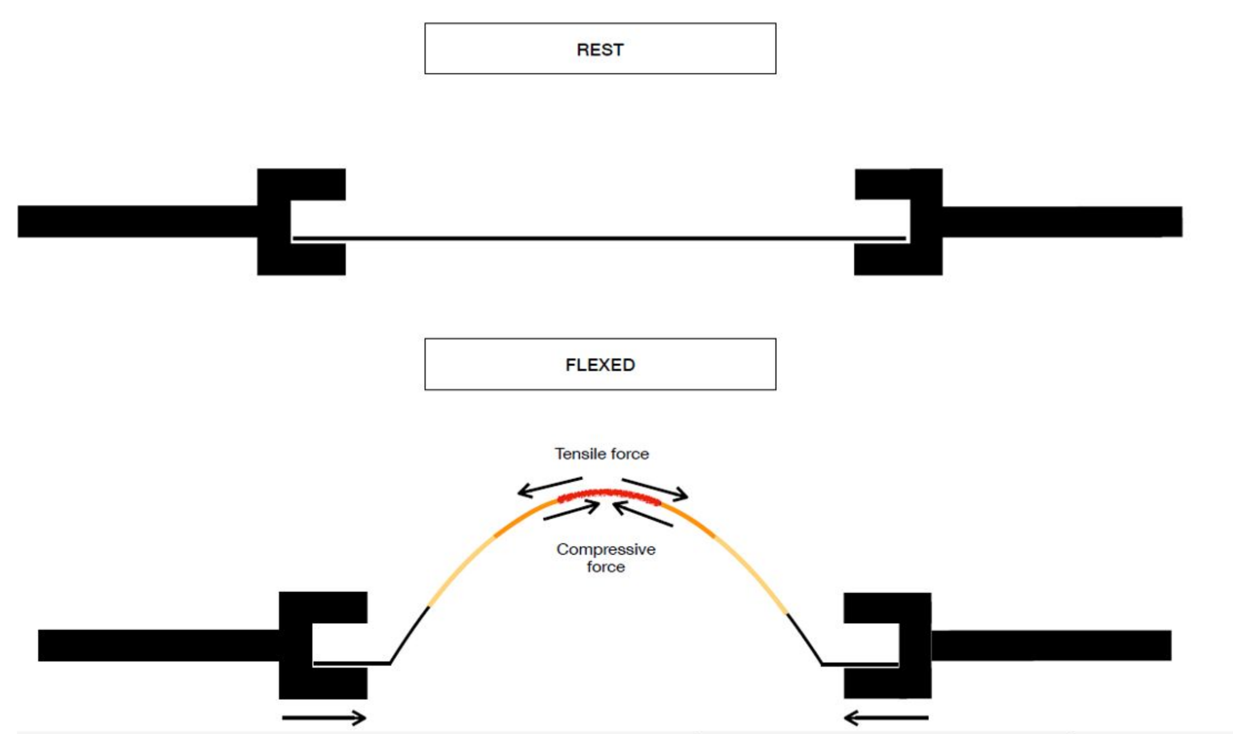
Why Additives?

Additives like natural polymers improve stability, enhance film formation, and increase mechanical flexibility, making the films more durable and suitable.



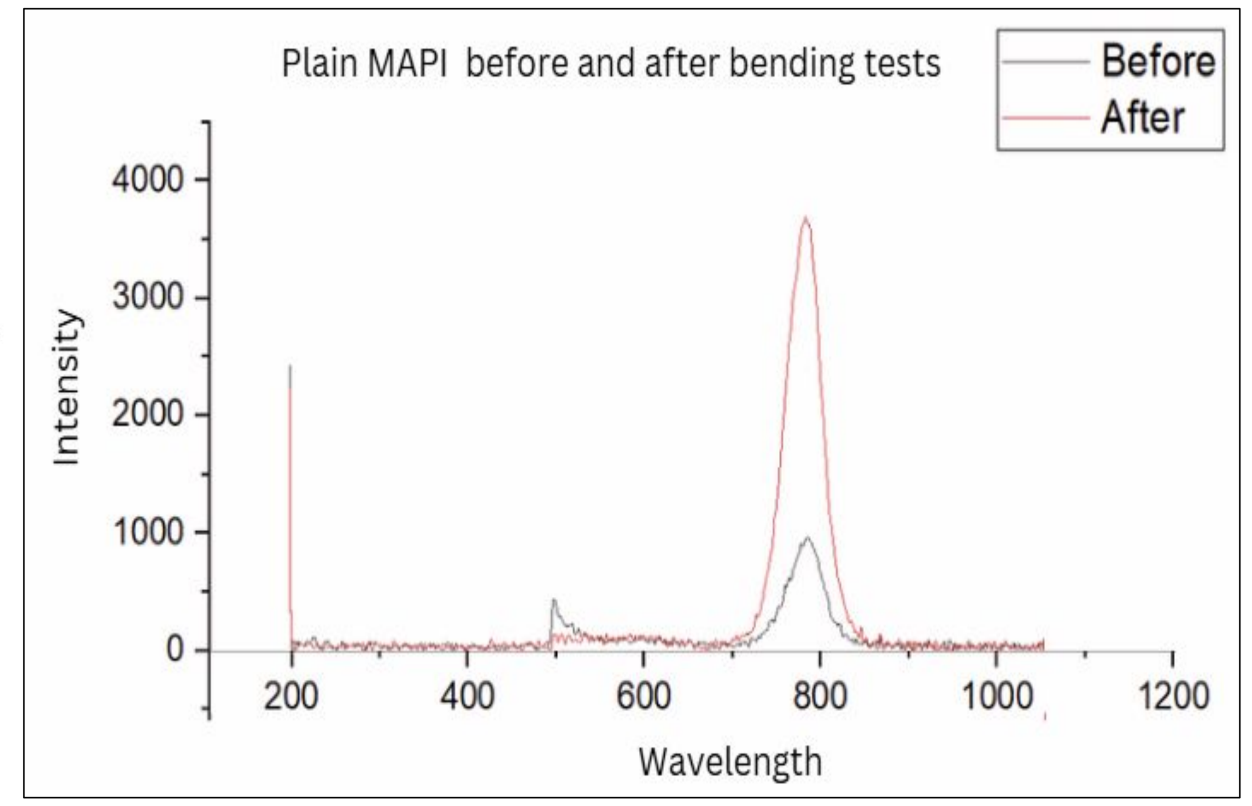
Fabrication and Testing

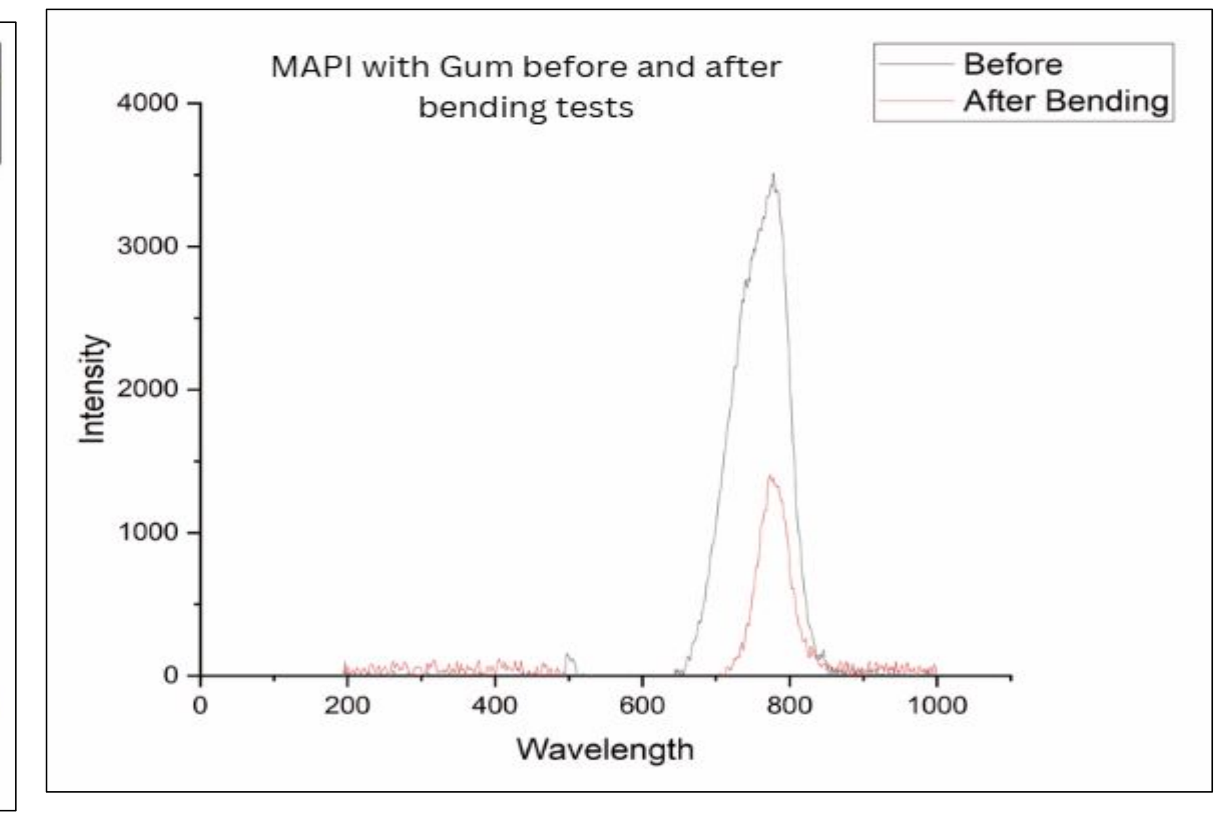
- Preheated ITO-coated PET substrates were blade-coated with 0.5 M $MAPbI_3$ in DMSO, with Gellan gum or starch additives.
- Samples were annealed at 100 °C to crystallize the perovskite films.
- Cyclic bending tests simulated real-world tensile stress to evaluate structural integrity.



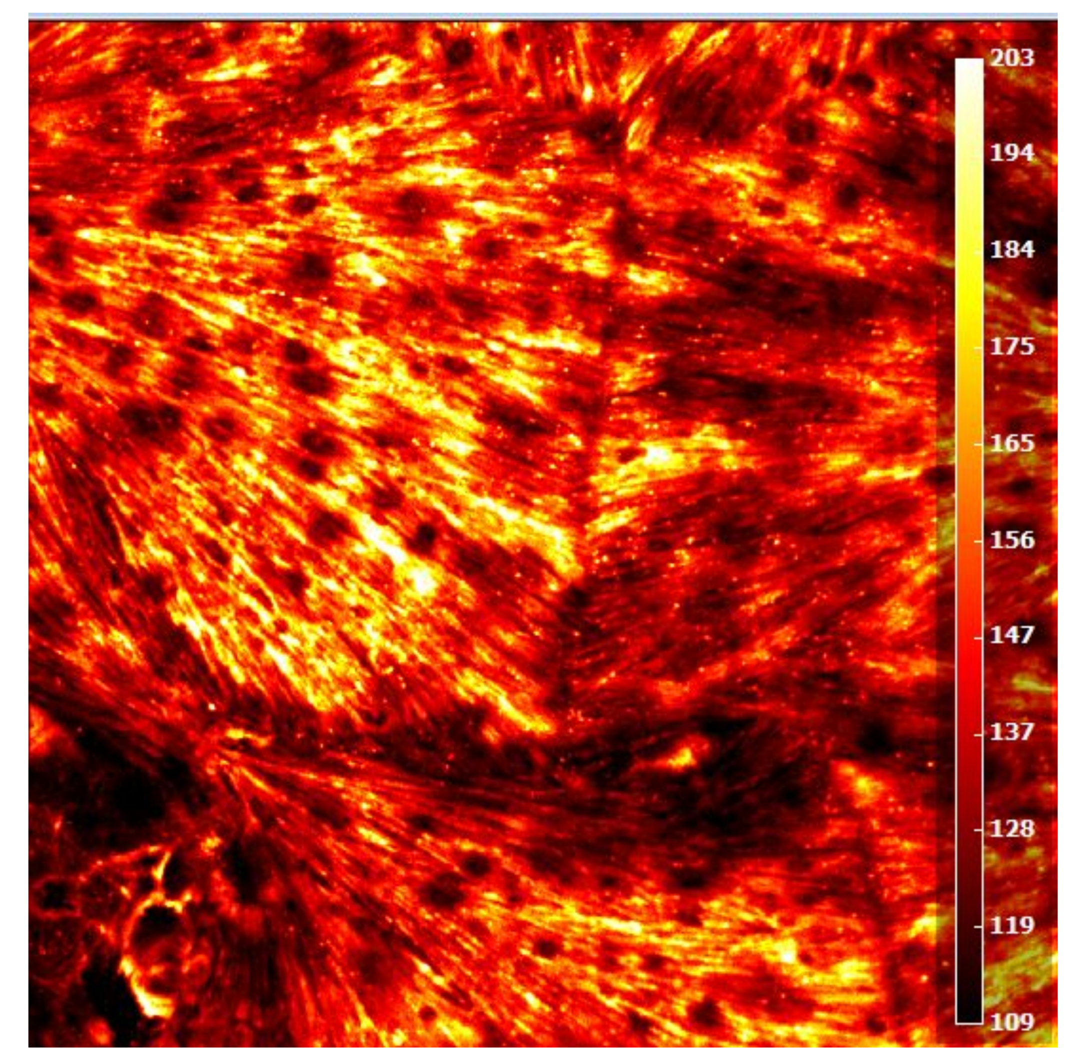
Results Post-bending tests revealed that plain $MAPbI_3$ samples exhibited increased photoluminescence(PL) intensity, whereas samples with gum additives showed a decrease in intensity

Steady state PL

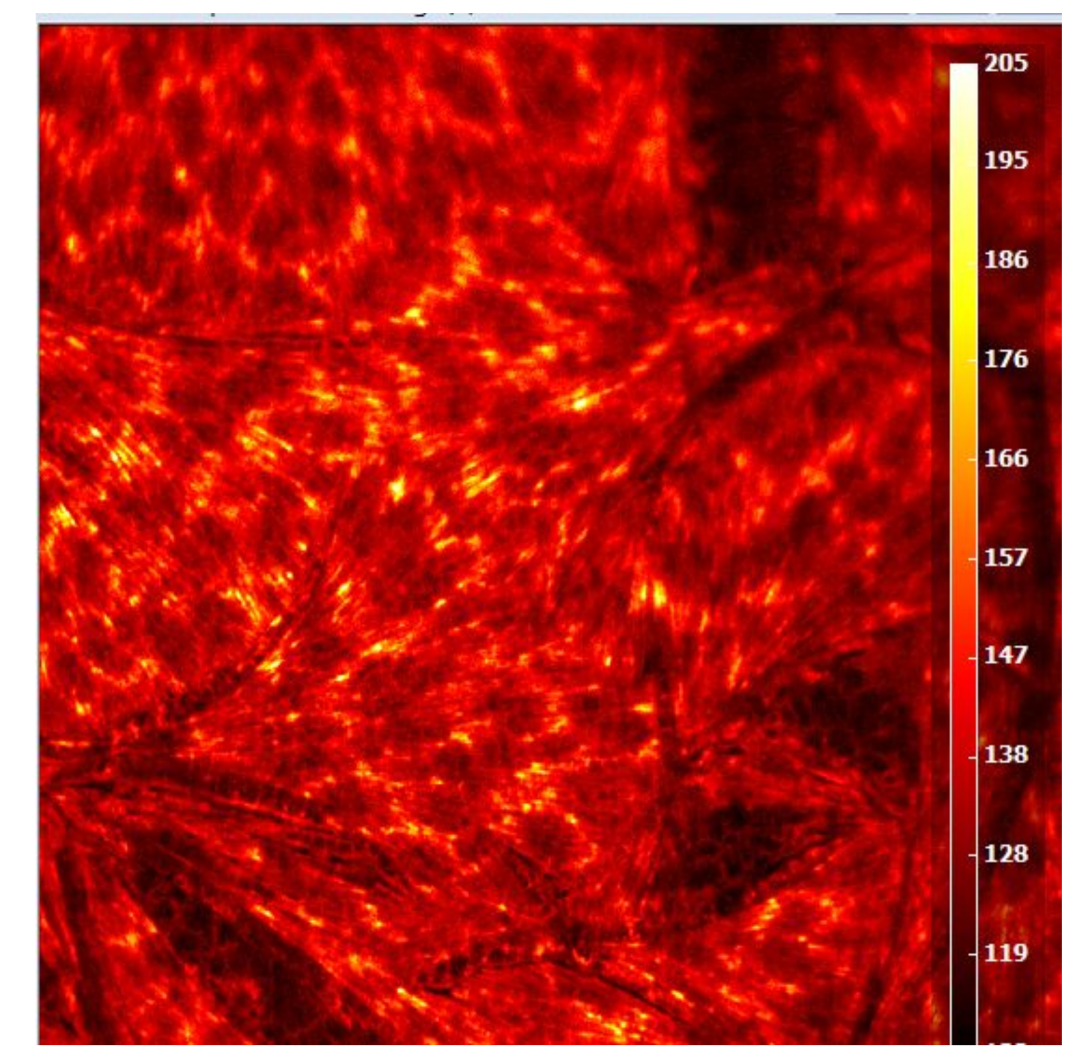




HyperSpectral PL Images – MAPI with Gum



Before Bending



After Bending

Future work

Additional structural and morphological characterization will be conducted to further understand the impact of mechanical stress and additive incorporation on film integrity

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