

Modeling Vapor Transport Deposition of Metal-halide Perovskite Thin Films for Photovoltaic and Optoelectronic Devices

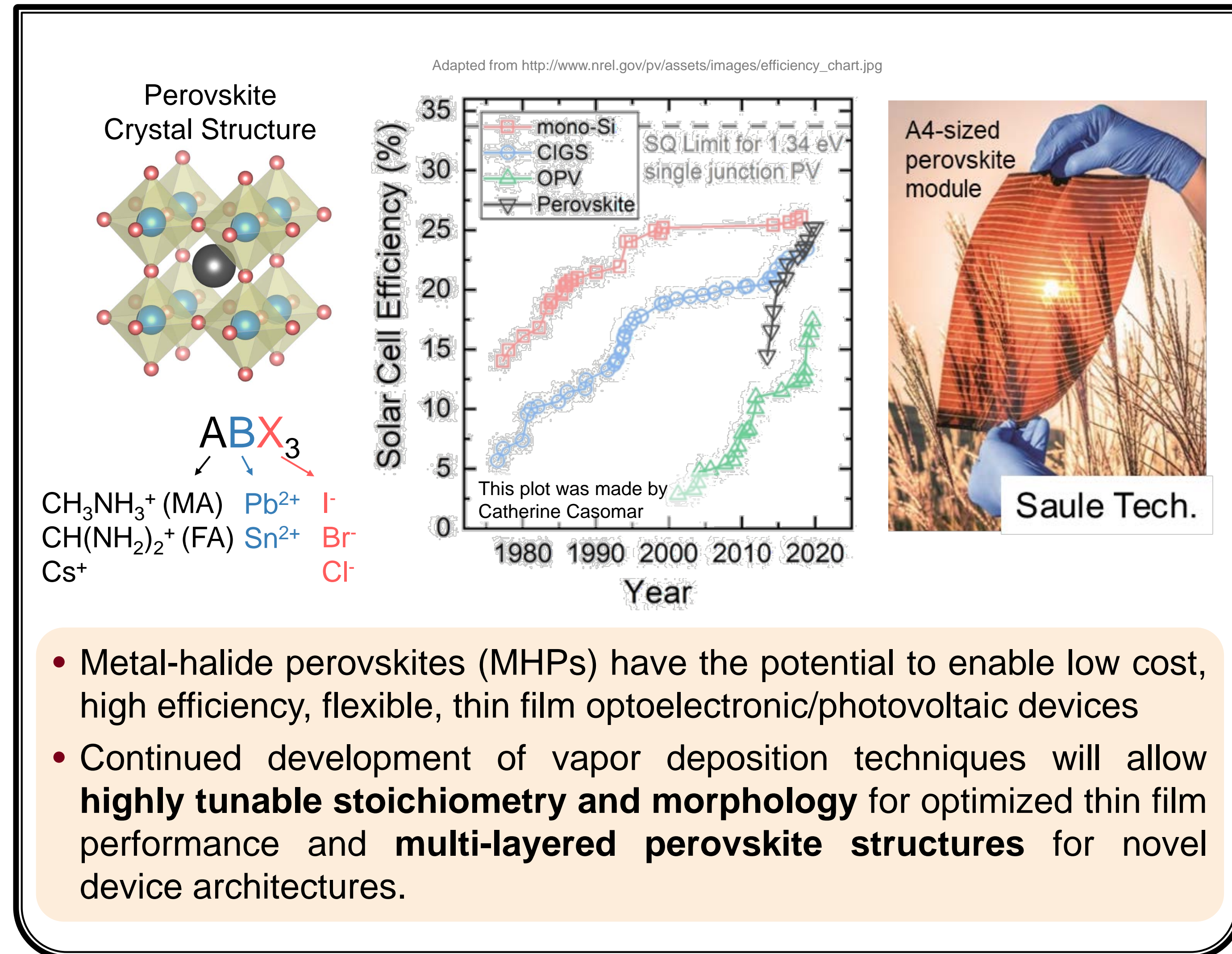
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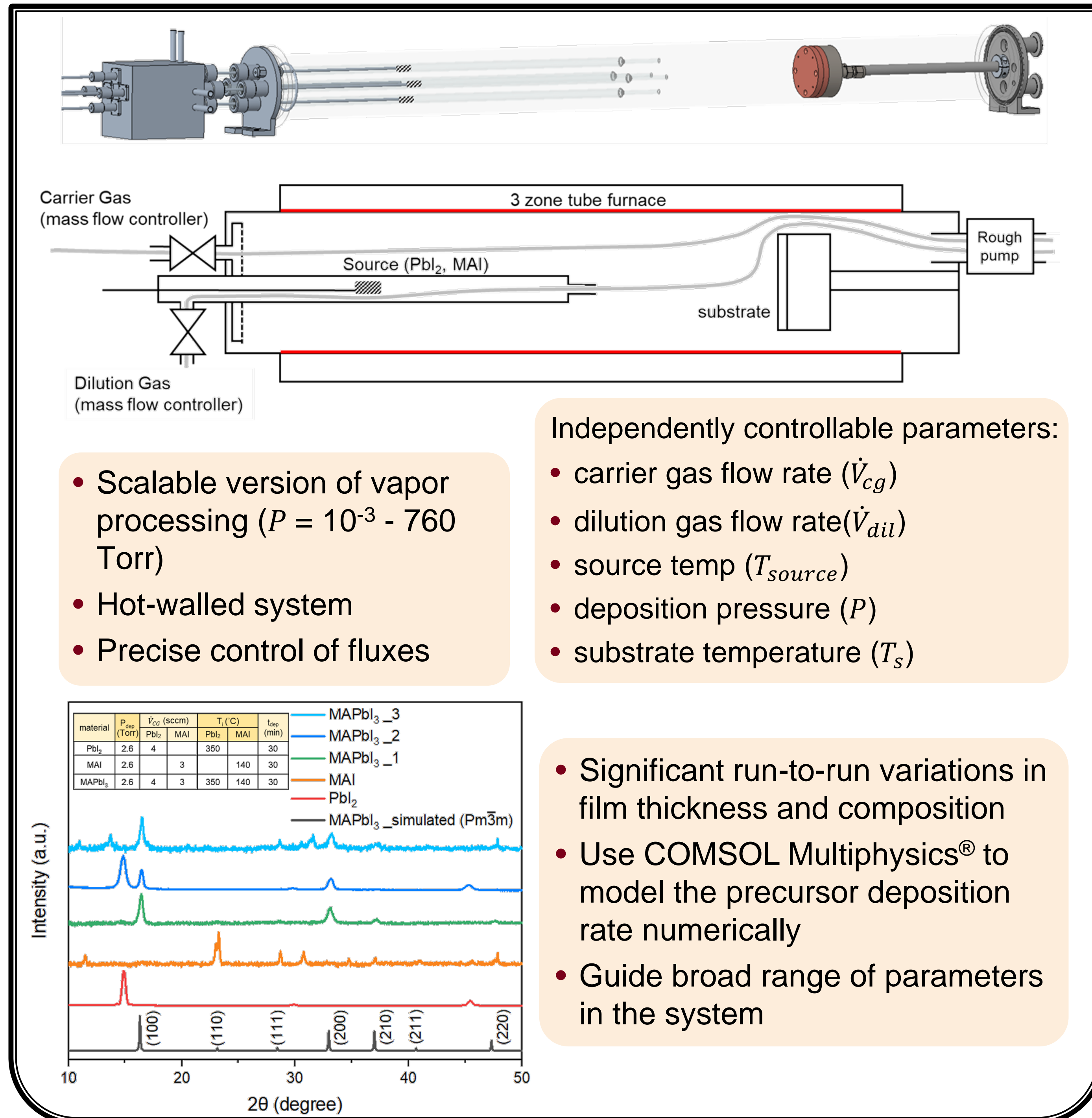
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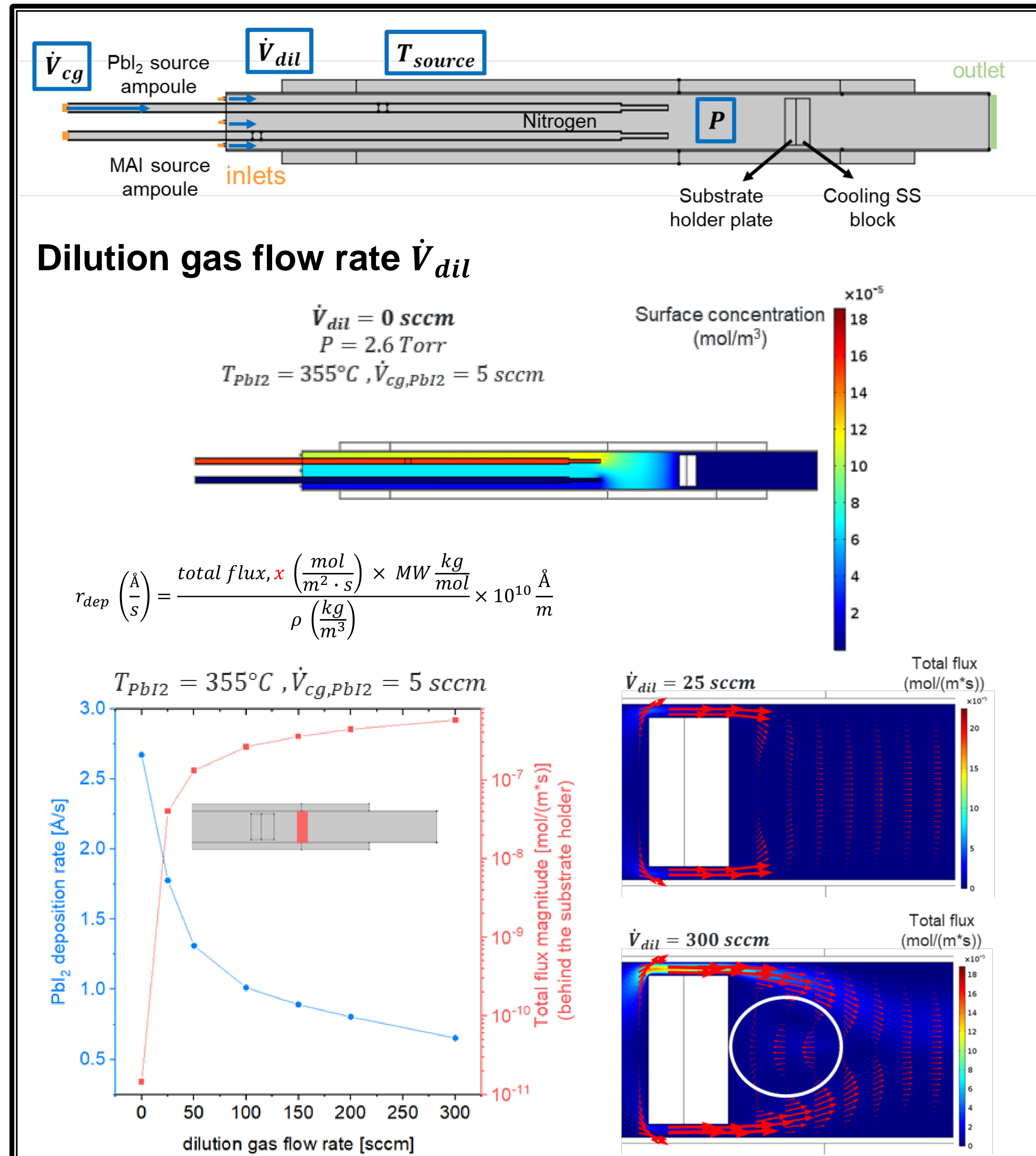
Motivations



Vapor Transport Deposition

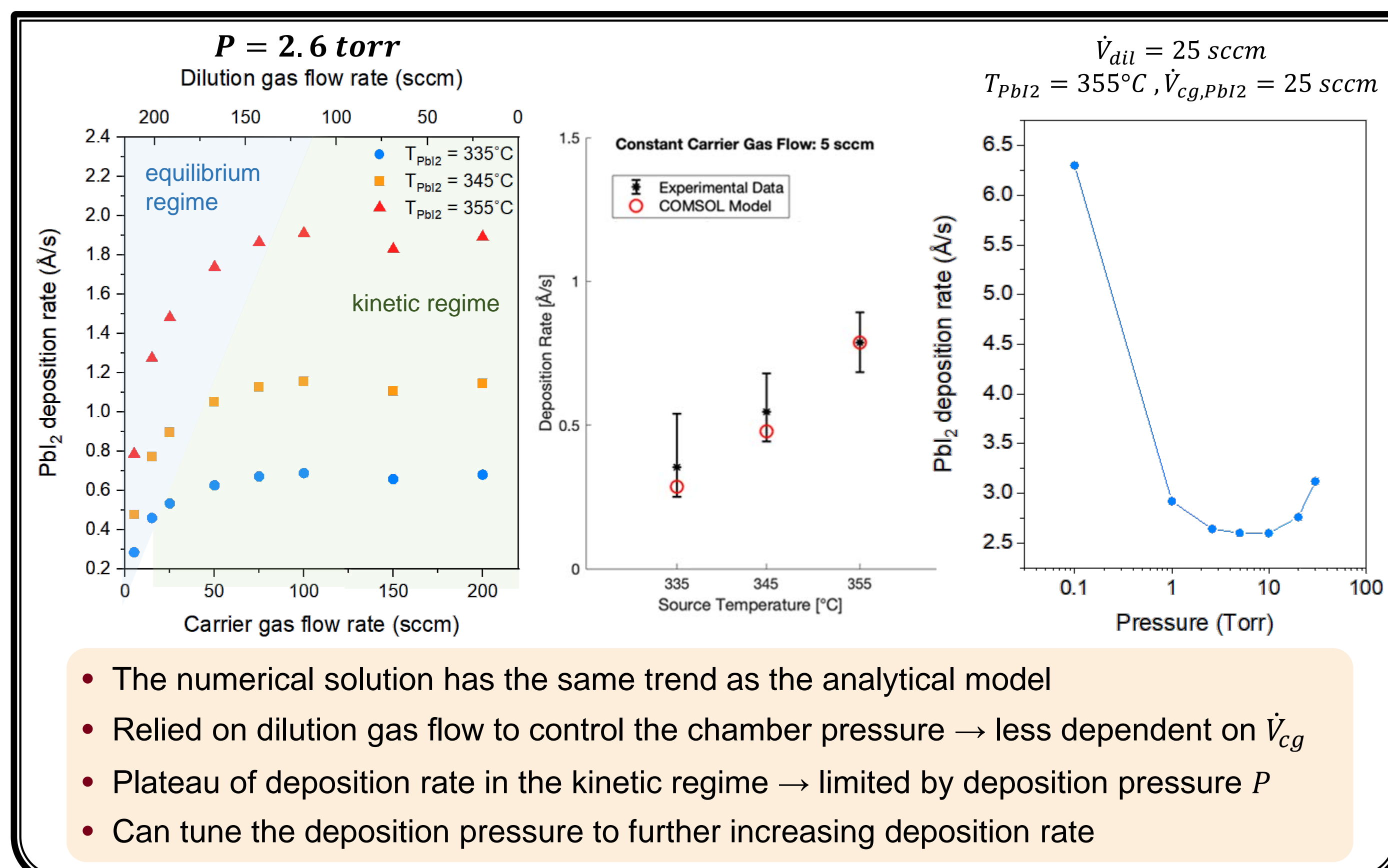


Numerical Modeling of Deposition Rate



- Material accumulation if $\dot{V}_{dil} = 0$ sccm
- Deposition rate decreasing with increasing \dot{V}_{dil}
- Forming opposite direction flux behind the substrate holder with high \dot{V}_{dil}
- Reduces the material usage efficiency

Guiding Other Deposition Parameters



Summary

- A COMSOL model was developed to describe the vapor transport deposition system, providing insight into system hydrodynamics and mass transport effects.
- Once the effects of the dilution gas flow were incorporated, the model provided a reasonable description of the PbI_2 deposition rate vs. source temperature and carrier gas flow rate.
- Given the strong dependence of deposition rate on reactor pressure, recommend investigating instrumentation to allow that to be more closely controlled as other parameters are varied.