

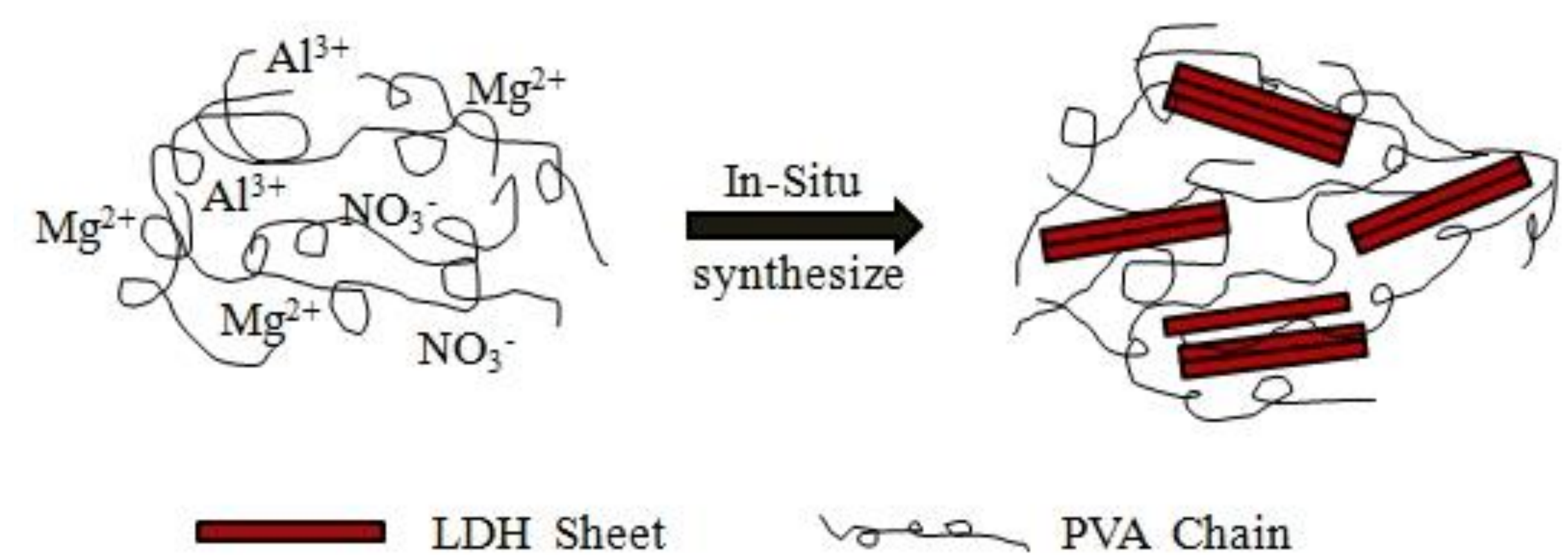


A Study on PVA/LDH In-Situ Composite Films

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Introduction

Nowadays most of the PVA/LDH nanocomposites were prepared through conventional solution blending [1-3], long preparation period and poor dispersion of LDH in PVA matrix are the most two serious problems of this method. In this study, PVA/LDH films with excellent properties were in-situ prepared, the structure and properties of PVA/LDH nanocomposites were characterized by XRD, SEM, AR-G2 and so on.



Preparation of PVA/LDH

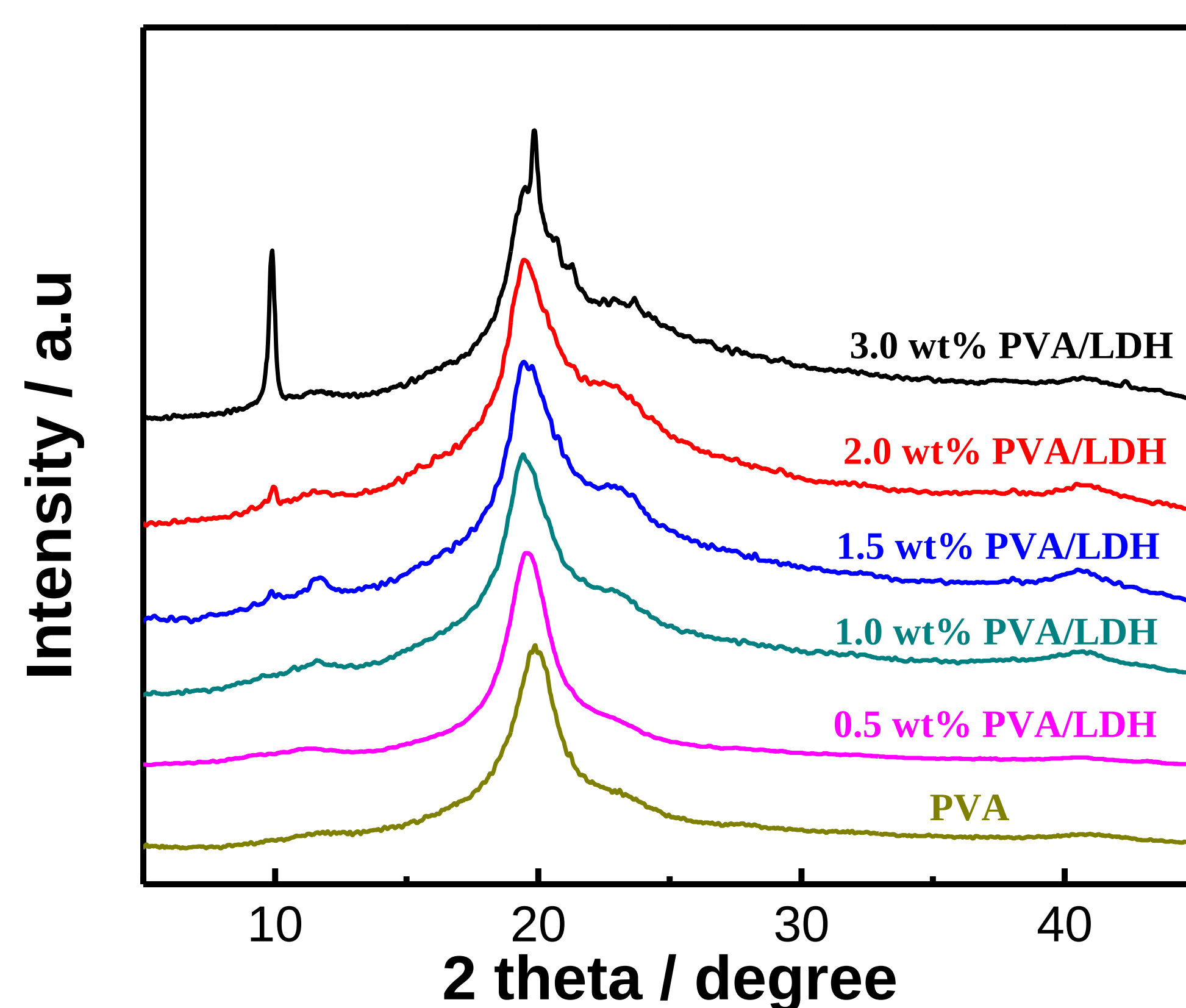


Fig. 1 WAXRD patterns of PVA and PVA/LDH nanocomposite films synthesized via in-situ method.

The characteristic reflections corresponding to the (003) plane for LDH were observed, indicating the LDH had been in-situ prepared.

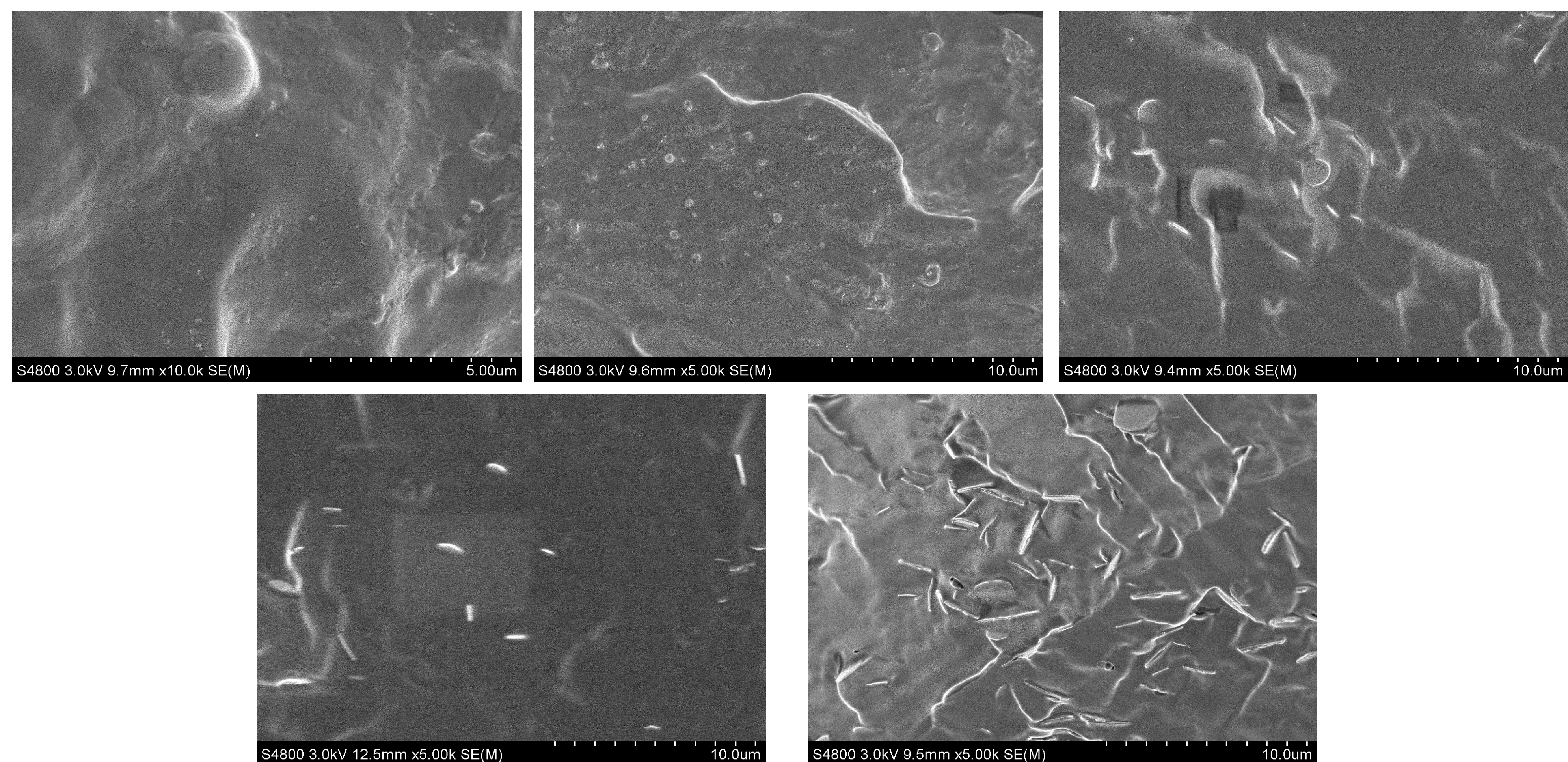


Fig. 3 SEM micrographs of PVA/LDH composite films synthesized via in-situ method. (a) 0.5 wt%; (b) 1.0 wt%; (c) 1.5 wt%; (d) 2.0 wt%; (e) 3.0 wt%.

LDH particles were homogeneously dispersed in PVA matrix without aggregation as evidenced by SEM observations, which can lead to the improvement of mechanical properties.

Character and Results

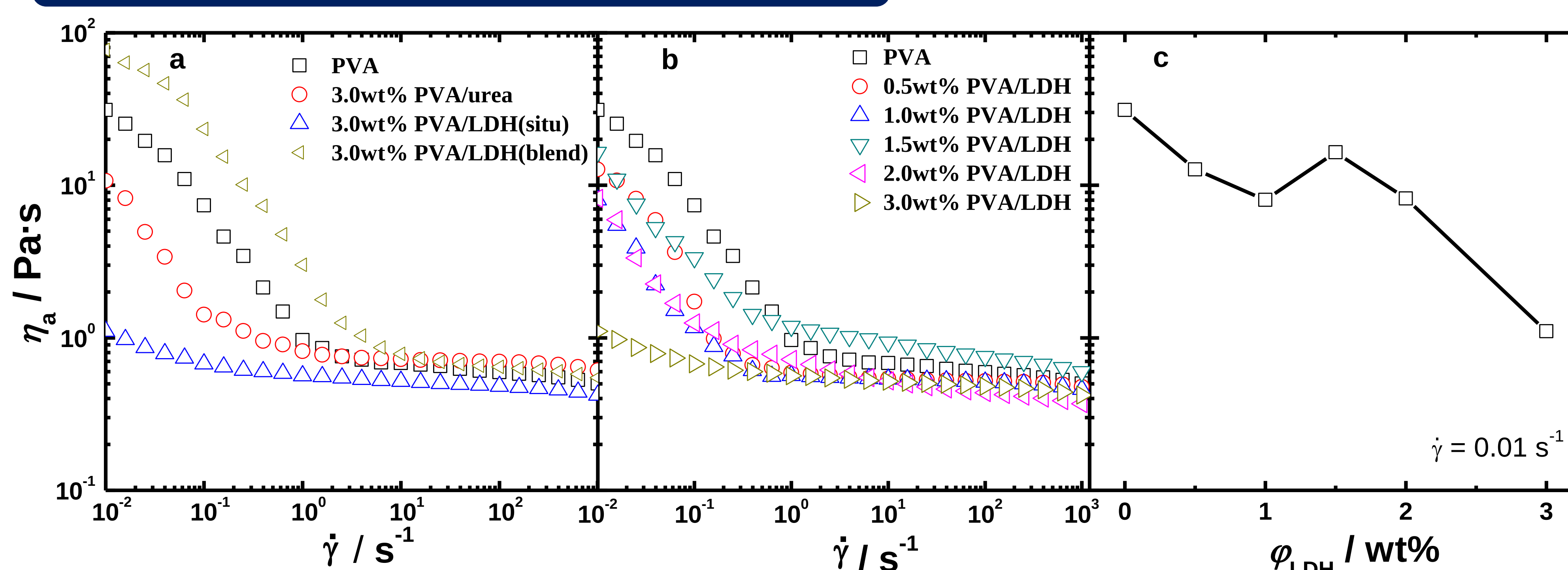


Fig. 2 (a, b) Steady viscosity as a function of shear rate for PVA solution and PVA/LDH suspensions at 20 °C; (c) $\dot{\gamma}$ at = 0.01 s⁻¹ for PVA/LDH suspensions with various LDH loadings.

Interesting thing is that the in-situ PVA/LDH composite aqueous solution shows lower viscosity than that of PVA aqueous solution and the viscosity decreases with LDH content, which is in strong contrast to that by traditional simple mixing. LDH layers are considered to shield the entanglement of PVA chains and thus lead to the decreasing solution viscosity.

Conclusions

1. Poly(vinyl alcohol)/layered double hydroxide (PVA/LDH) composite films with different LDH contents have been fabricated through casting with an in-situ hydrothermal treatment.
2. The decreasing solution viscosity can be ascribed to the shielding effect of LDH layers.
3. The tensile strength and elastic modulus of PVA/LDH film are improved by about 105.4 % and 133.2 %, respectively, when incorporating with 1.0 wt% LDH.

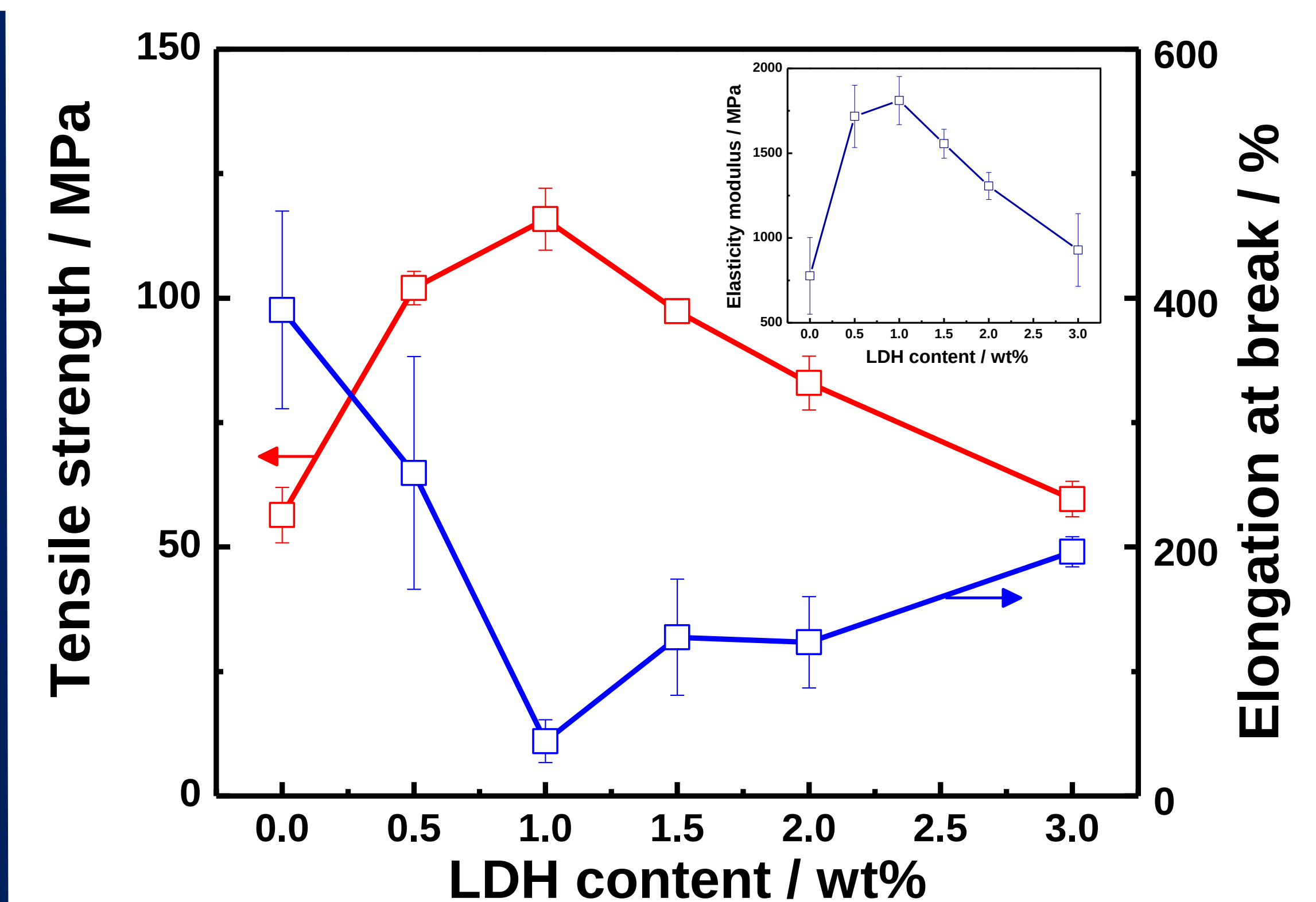


Fig. 4. The mechanical properties of PVA and PVA/LDH composite films

The tensile strength and elastic modulus of PVA films are improved by introducing LDH particles. With the LDH content of 1.0 wt%, the tensile strength and elastic modulus of the corresponding composite films are improved by about 105.4 % and 133.2 %, respectively, compared with that of a neat PVA film.

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