

Tough physical hydrogel films prepared by spin-coating

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Abstract: Hydrogel films received increasing attentions due to their promising applications in molecular separation, medical dressings, etc. However, they are usually mechanically weak, limiting the handling and applications of these materials. Here we demonstrate the preparation of tough physical gel films by spin coating and subsequent physical gelation of poly(acrylic acid-co-acrylamide) in FeCl₃ solution. The thickness and mechanical properties of gel films can be facilely tuned by polymer composition and spin-coating conditions. Furthermore, thermoresponsive gel films are fabricated by spin-coating of poly(acrylic acid-co-N-isopropylacrylamide) solution in a similar way; the obtained films show fast response and large stroke, which are an ideal material of artificial muscles and soft actuators.





Figure 3. (A,B) Tensile stress-strain curves (A) and corresponding mechanical parameters (B) of gel films with different f (thickness~100 µm). (C,D) Tensile stress-strain curves (C) and corresponding mechanical parameters (D) of gel films with different thickness.

P(AAc-co-NIPAm) gel films





Figure 6. Schematic (A) and photos (B) to show the temperature-triggered bending of P(AAc-co-AAc)/P(AAc-co-NIPAm) bilayer gel film.

Conclusions: In summary, tough physical hydrogel films with tunable thickness and mechanical properties have been facilely prepared through spin-coating. The thermoresponsive P(AAc-co-NIPAm) gel films showed fast response and large stroke, which can be used to fabricate soft actuators.

References

[1] Zheng, S. Y.; Ding, H. Y.; Qian, J.; Yin, J.; Wu, Z. L.; Song, Y. H.; Zheng, Q. *Macromolecules*, **2016**, 49, 9637.

[2] Kelly, K. D.; Schlenoff, B. J. ACS Appl. Mater. Interfaces., 2015, 7, 13980.