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# Modeling the Urea-Actuated Osmotic Pressure Response of Urease-Loaded Hydrogel for Osmotic Urea Biosensor

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## Highlights

- The urea-actuated osmotic pressure response of urease-loaded hydrogel is investigated.
- A multiphysics model is formulated, establishing the hydrogel's osmotic pressure-urea relationship.
- The osmotic pressure response of the hydrogel increases bilinearly with urea concentration.
- The hydrogel converts bioelectrochemical energy into a mechanical one, responding to urea cues.

Abstract: This paper describes the urea-actuated osmotic pressure response of urease-loaded hydrogel in salt solution, possibly initiating the development of osmotic urea sensor.

Herein, a multiphysics model is formulated to elucidate effects of urea concentration on the osmotic pressure of urease-loaded hydrogel by incorporating bio-electrochemical interactions between environmental urea-rich salt solution and functional groups within the

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