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FUNCTIONAL HYDROGELS FABRICATED VIA 4D PRINTING – SYNTHESIS AND EVALUATION OF RESPONSIVE PROPERTIES

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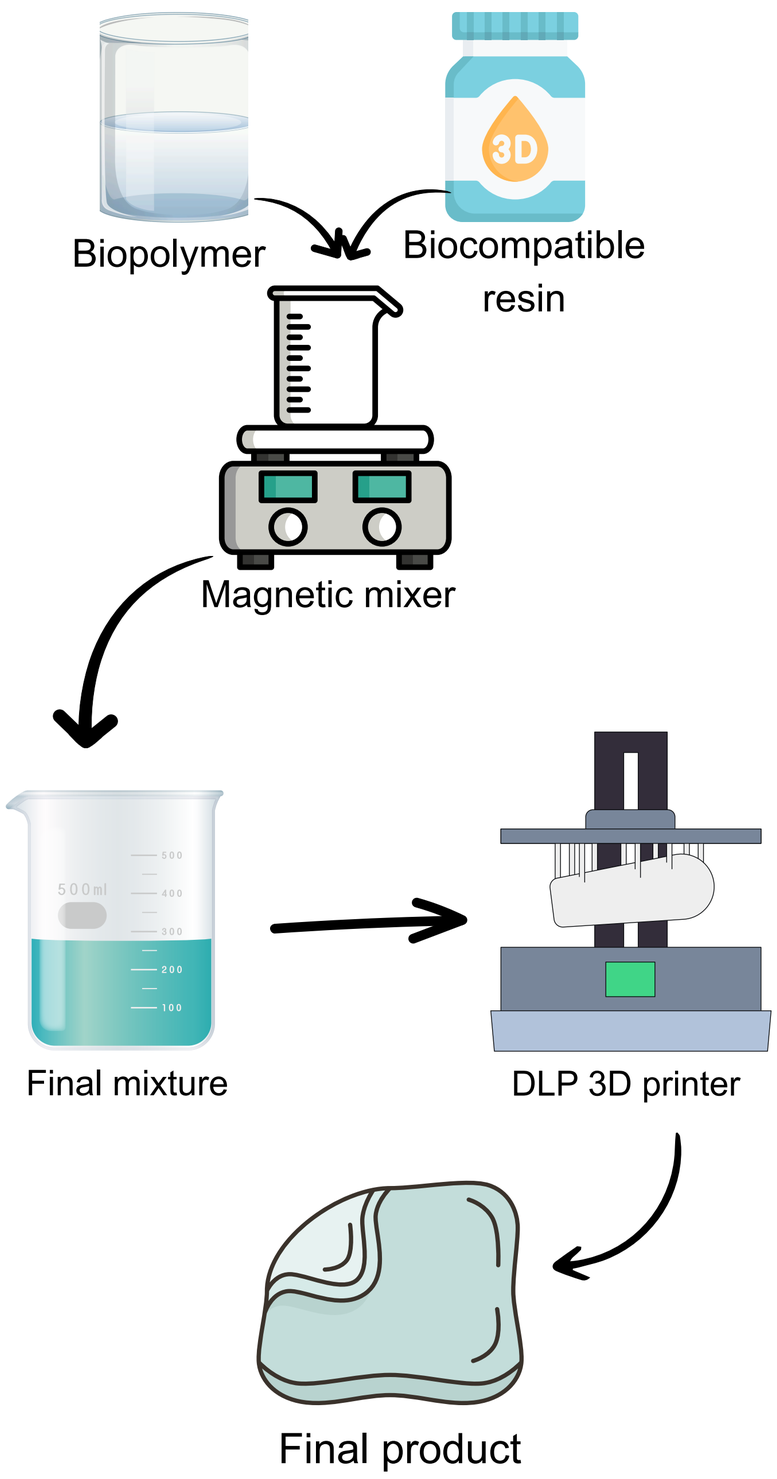
INTRODUCTION & AIM

In this study, functional hydrogels were developed using advanced 4D printing technology, enabling the design of materials capable of dynamically responding to environmental stimuli. This approach allowed the fabrication of structures with programmable changes in shape and properties triggered by external factors such as temperature and humidity.

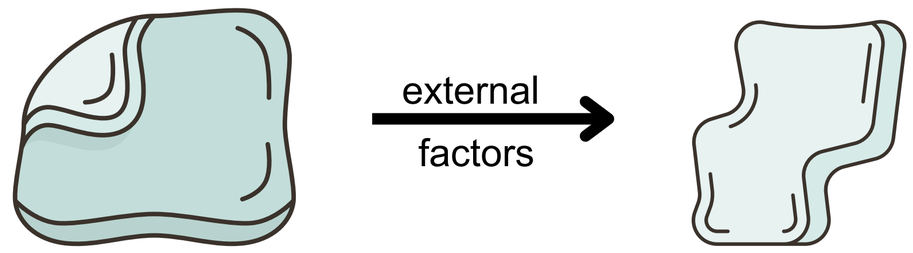
METHOD

The obtained hydrogels were subjected to comprehensive characterization, including morphological analysis, evaluation of swelling and shrinkage behavior under varying conditions, structural stability, and mechanical performance.



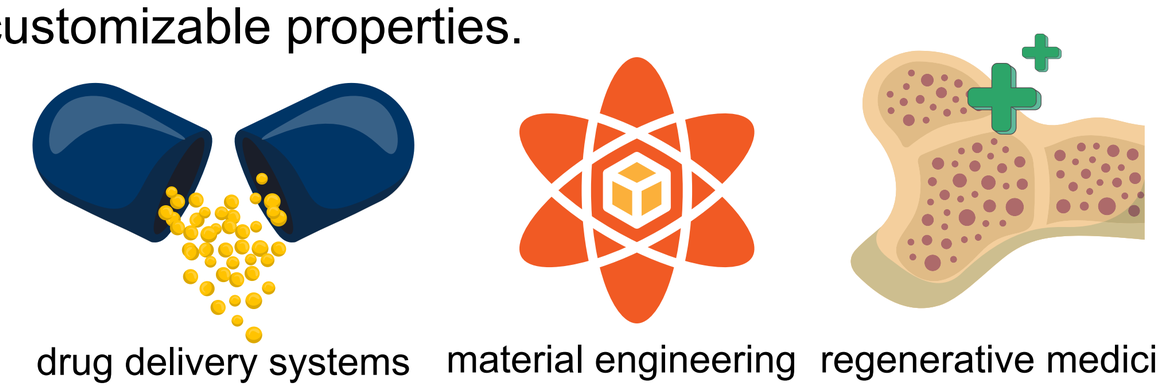
RESULTS & DISCUSSION

The results demonstrated that the use of 4D printing enables precise control over the architecture of hydrogel structures and provides the ability to engineer tailored responsive functionalities. Furthermore, correlations were identified between the hydrogel composition and the kinetics of their response, offering possibilities for designing materials adapted to specific biomedical or engineering applications.



CONCLUSION

The findings confirm that the developed hydrogels hold significant potential in areas such as regenerative medicine, drug delivery systems, and material engineering, where adaptability to changing environmental conditions is crucial. This work highlights the role of 4D printing as a powerful tool for the creation of intelligent materials with dynamic and customizable properties.



drug delivery systems material engineering regenerative medicine

FUTURE WORK / REFERENCES

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