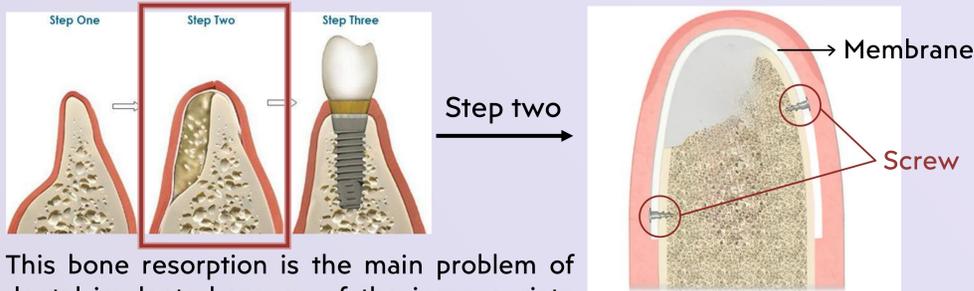


## ABSTRACT

Biodegradable screws are being used to replace titanium screws to anchor the membrane for bone regeneration before dental implants. In this study, polymer composites have been fabricated and characterized for application in dentistry. Polylactic acid and hydroxyapatite are used as precursors for screw injection molding. The morphologies of polymer composites were observed by scanning electron microscope. Chemical structures were characterized by Fourier transform infrared spectroscopy. The mechanical properties were obtained from compression testing. Finally, the sample's degradation was monitored for at least two months to confirm that it occurred at the appropriate period.

## INTRODUCTION

### Dental implants treatment



This bone resorption is the main problem of dental implants because of the inappropriate bone size, so bone grafting is required before dental implants are placed.

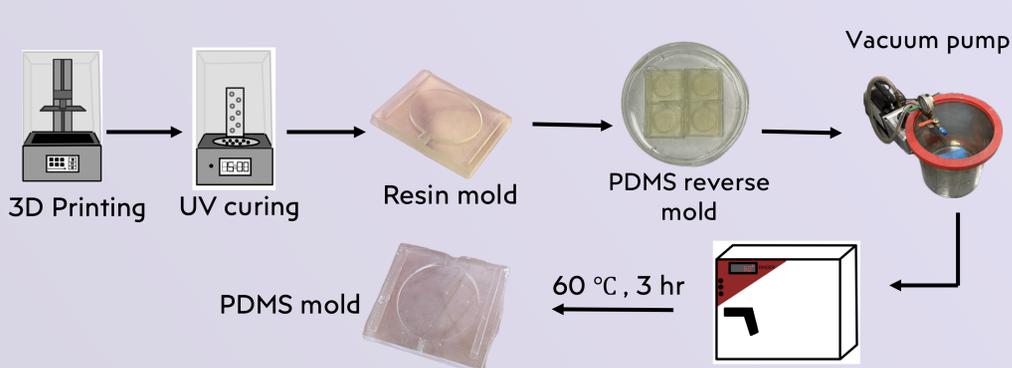


## OBJECTIVE

To investigate and enhance the properties of polymer composites for optimal suitability in dental applications.

## METHODOLOGIES

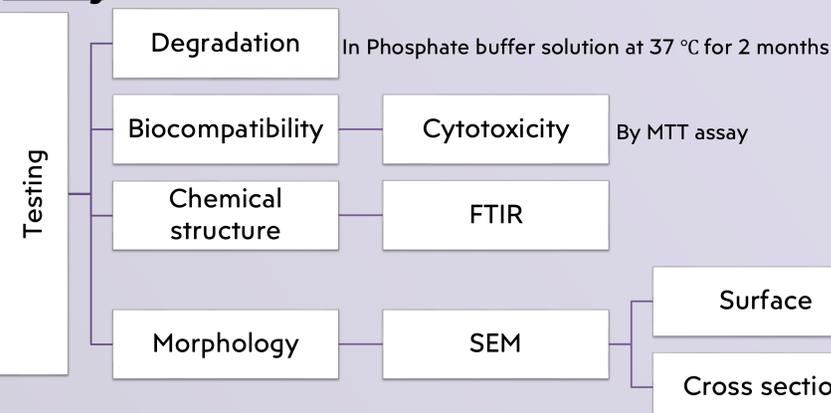
### Resin 3D print mold



### Preparing composite polymer (PLA/HA)



## Testing



## RESULTS AND DISCUSSION

### Morphology by Scanning Electron Microscope (SEM)

- Surface of PLA/HA composite polymer, white dots of HA were found interspersed in the PLA matrix phase.
- White dot of HA was not found in pure PLA for both SEM images of surface and cross section.
- Cross section image of PLA/HA composite, HA was also found dispersed inside the matrix phase of PLA.

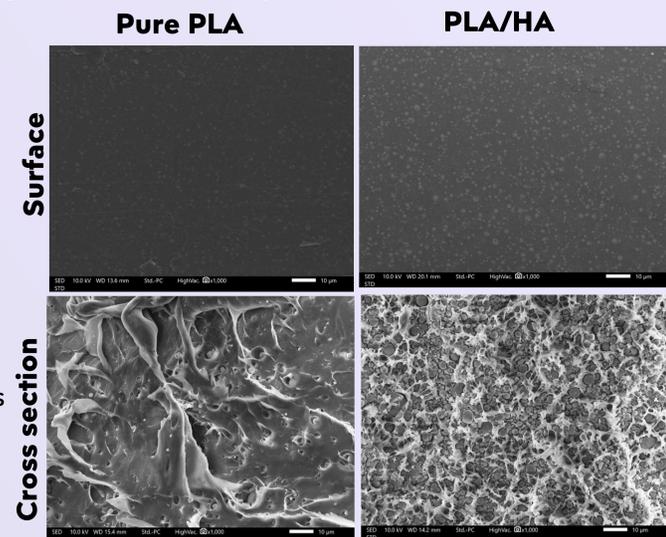
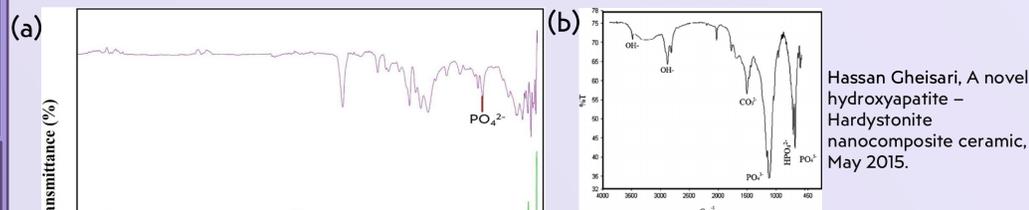


Fig.1. SEM images of pure PLA and PLA/HA polymer composite.

### Chemical structure by Fourier Transform Infrared Spectroscopy (FTIR)



Hassan Gheisari, A novel hydroxyapatite – Hardystonite nanocomposite ceramic, May 2015.

Type	Functional group	Wavenumber (cm <sup>-1</sup> )
PLA	C=O (carbonyl group)	1750
	CH stretching	1350-1500
	C-O bond	1200-1000
HA	COOH (carboxyl group)	850
	PO <sub>4</sub> <sup>2-</sup> (phosphate group)	550

### Degradation test

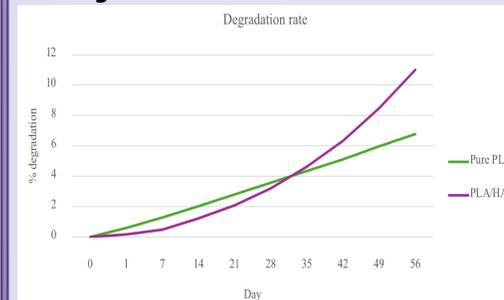


Fig.3. Degradation graph of PLA and PLA/HA polymer in PBS, At 37°C for 56 day.

In the beginning, pure PLA showed a higher degradation rate than PLA/HA and after 28 days PLA/HA was degraded faster than PLA. At 56 days, PLA/HA showed the degradation around 12%, While pure PLA showed the degradation around 6%

### Biocompatibility test by MTT assay

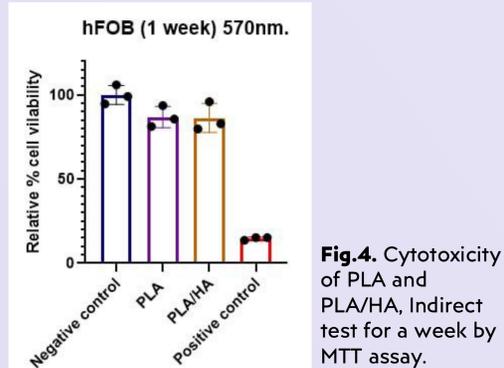


Fig.4. Cytotoxicity of PLA and PLA/HA, Indirect test for a week by MTT assay.

PLA and PLA/HA showed cell viability over 85%. The results indicating that PLA and PLA/HA did not toxic to the bone cell (hFOB)

## CONCLUSIONS

The composite polymer of PLA/HA has been successful fabricated through injection molding. Moreover, the HA may influenced the degradation kinetics of the composite polymer, potentially accelerating the degradation rate of PLA/HA over extended periods, thus. Additionally, PLA and PLA/HA composites demonstrated non toxic to hFOB, suggesting these materials may serve as viable candidates for biomedical applications.

## ACKNOWLEDGEMENTS

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