Highly efficient propagation of coral tissues using bone regeneration techniques

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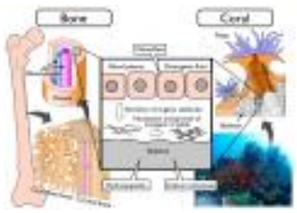
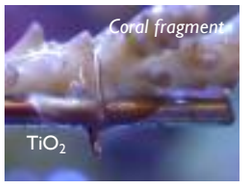
Introduction

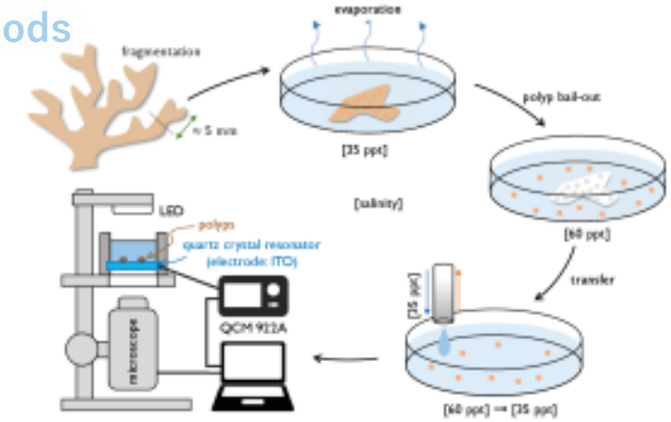
➢Roughly one-quarter of coral reefs worldwide are already considered damaged beyond repair, with another two-thirds under serious threat. Up to now, several restoration techniques of corals such as fragmentation, farming, Biorock have been developed for such issues in the past few years.





The purpose of this work was explore a highly efficient method of coral propagation using TiO_2 coated substrates as scaffolds which was expected to have good tissue compatibility for various organisms.

➢Methods



➢The corrected polyps were seeded on TiO_2 coated substrates. The films were fabricated by the anodisation of Ti, Or the conventional RF sputtering using Ti target.

Results

➢Figure 1 shows polyps bail-out rection due to an increase in salinity.
➢The connective tissue of polyps gradually thinned, and then were eventually disconnected.
➢The polyps were isolated and swam, and the naked skeleton was exposed.

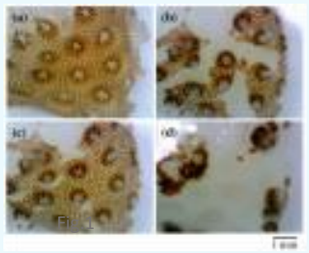


Fig.1 Polyps that bail out of the skeleton

➢ The separated polyps preferentially adhered to the TiO_2 surface and expanded vigorously.
➢Twenty-four hours after sowing the polyp, the resonant frequency decreased and the resonant resistance began to increase.
➢ This might be due to the adhesion and expansion of the polyps to/on the substrate.
➢In the FR plot, a microscope was used to capture the vigorous expansion of the titanium oxide film from 24 hours to 36 hours.

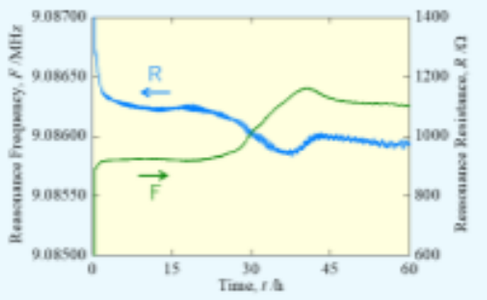


Fig.2 Seed polyps and change resonance frequency and resonance resistance over time.

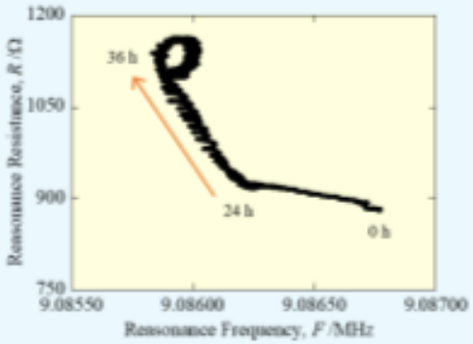


Fig.3 F-R diagram in Figure 3 and polyps observed over 24 to 36 hours.

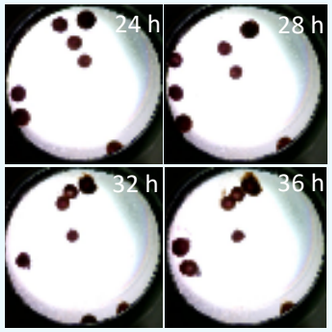


Fig.4 Adhesive behavior of polyps

Conclusion

The highly efficient method of coral propagation using TiO_2 coated substrates as scaffolds was investigated. The following conclusions were reached

1. The polyps were isolated from the skeleton by the environmental stress with controlling salinity which is without the use of enzymes or other chemicals.
2. The separated polyps preferentially adhered to the TiO_2 surface and expanded vigorously.
3. The adhesion process of polyps on substrates could be detected by means of QCM technique.

Refernce

[1] Sammarco P.W. Mar. Ecol. Prog. Ser. 1982; 10: 57–65.
[2] Fordyce A.J. et al. F1000Research 2017; 6: 687–696.
[3] Kang H.W. et al. Analytica Chimica Acta 2012; 171-172: 154–161.