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Supplementary Information

Novel Repeated Self-Healing Epoxy Composite with Alginate Multicore Microcapsules

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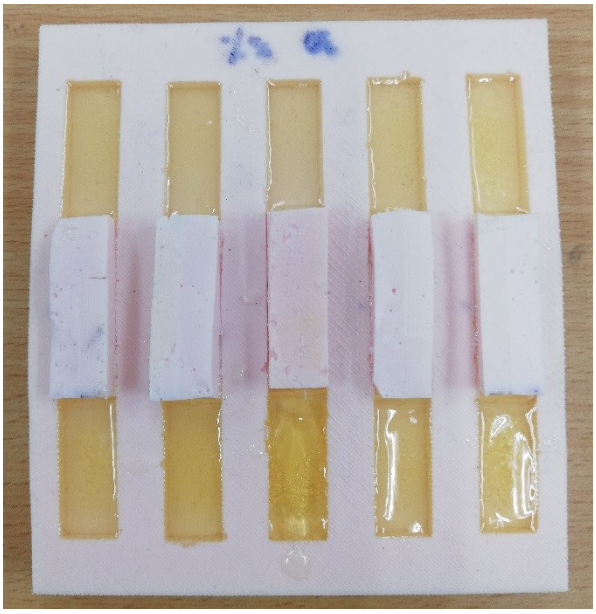

Fig. S1 Rubber mould of impact specimen with insert in the middle section that is for self-healing composites.

As shown in Fig. S1, the rubber silicon mould with rubber insert in the middle is used to fabricate Charpy impact specimens. After the epoxy is cured, the rubber inserts were removed and epoxy resin loaded with self-healing microcapsules were poured in to fabricate self-healing specimens.

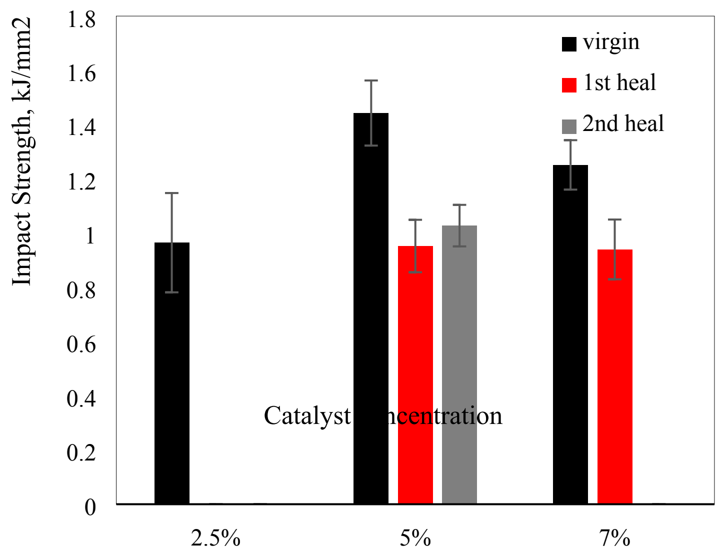

Fig. S2 Effect of catalyst loading on the impact strength of capsule-catalyst specimen filled with 20 wt% of epoxy microcapsules. Healing condition was 60 °C for 2 days.

As shown in Fig. S2, the graph indicates the healing efficiency of self-healing specimens filled with 20 wt% of alginate/epoxy microcapsules and Scandium (III) triflate ($Sc(OTf_3)$) catalyst at different loading. It can be seen that the optimum healing of the self-healing specimens occurred at 5 % catalyst loading where 2 time healing events were observed with healing efficiency of more than 65 %.

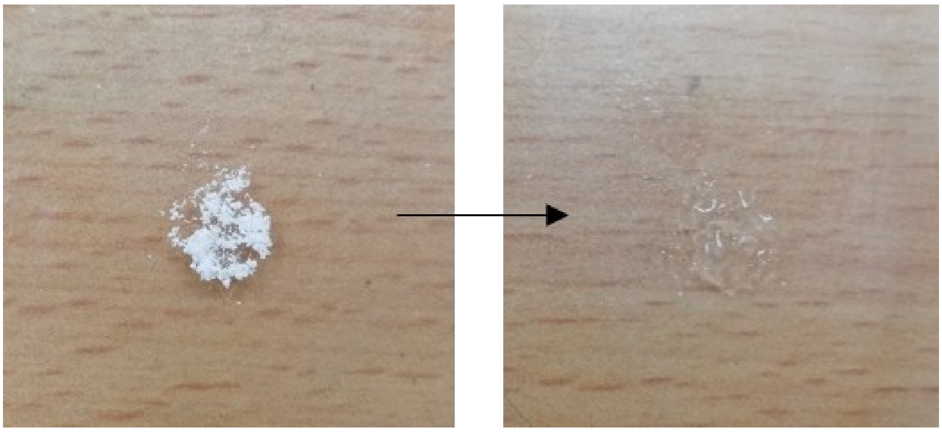

Fig. S3 Image of Sc(OTf$_3$) catalyst before and after exposing to the open air for 15 min.

In Fig. S3, the Sc(OTf$_3$) catalyst that was in powder form had transform to hydrate after exposing it to the environment at a short period of time. This proves that the catalyst is reactive to moisture and it can affect the healing of the self-healing composite after exposing the fracture surface to the environment even just for a short while.