

It's a Shell Game

Noah Evans¹ and Daniel Evans²

¹Howard Bishop Middle School, Gainesville FL

²Sea Turtle Conservancy, Gainesville FL



Introduction

Satellite telemetry of sea turtles has been used as a research and educational tool since the early 1990s. While the basic procedure for attachment of a satellite transmitter to sub-adult and adult Cheloniidae species has not changed much over the years, the adhesive materials used for the attachment have. The use of fiberglass and resin continues to be a reliable method (Balazs et al. 1996), but it can be difficult without the use of white lights. Two-part quick setting epoxies have become a common alternative adhesive (Mitchell 2000), but care must be taken to avoid products that generate high heat while curing.



Objective

PowerFast by Powers Fasteners was one of the first epoxies recommended as safe for attachments. When this was discontinued, it was replaced by T308+, also produced by Powers Fasteners. Recently T308+ has also been discontinued, leaving limited options for safe epoxy adhesives.

Our objective was to test six possible replacement epoxy adhesives (PowerFast Pure 110+; PowerFast Pure 50+; FGCI Superbond Epoxy Adhesive; Vettec Equi-Thane Hoof Adhere; Loctite Marine Epoxy; and Sika Pro Select Anchoring Adhesive) against T308+ to find one that is similar in curing temperature and setting time.

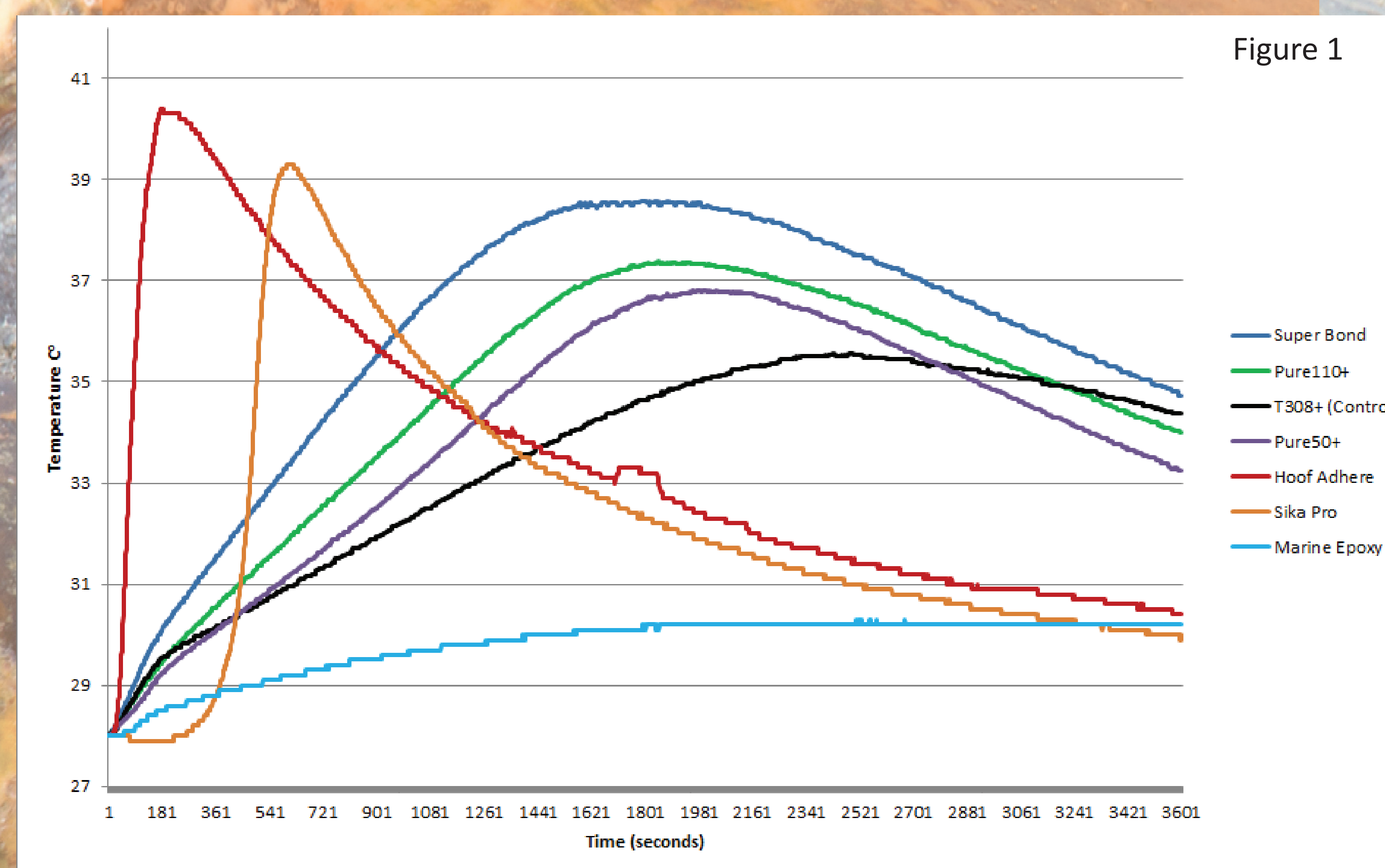


Results

Both Hoof Adhere and Sika Pro showed an initial high spike in temperature (> 39 °C) before cooling down, while the temperature of the control and other adhesives slowly increase to a maximum temperature (30.2 - 37.8 °C) before cooling down (Figure 1, Table 1).

Compared to the control, the Hoof Adhere showed the greatest change in temperature with a change of 12.4 °C, while the Loctite Marine Epoxy showed the least change in temperature with an increase of 2.2 °C (Table 1).

While the Loctite Marine Epoxy had the lowest temperature change, it was still not set at the end of the 60 minutes. It took more than 90 minutes to completely set.



To account for slight differences in the temperature probes, all temperatures were adjusted to have the same starting point (28° C).

	Ave Max Temp °C	Ave Temp Increase °C	Time to Reach High Temp (min)
Super Bond	39.1	11.1	27.0
Pure110+	37.8	9.8	30.5
T308+ (Control)	36.2	8.2	40.5
Pure50+	36.9	9.0	31.3
Hoof Adhere	40.4	12.4	2.9
Sika Pro	39.3	11.3	10.0
Marine Epoxy	30.2	2.2	41.8

Literature Cited

Balazs, G. H., R. K. Miya, and S. C. Beavers. 1996. Procedures to attach a satellite transmitter to the carapace of an adult green turtle, *Chelonia mydas*. Proceedings of the 15th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech Memo NMFS-SEFSC-37.
 Mitchell S.V. 1998 Use of epoxy in telemeter attachment. Proceedings of the 18th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech Memo NMFS-SEFSC-436.

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Procedure

A Pasco Spark Data Logger with Temperature Probe was attached to the underside of each ¼ inch gypsum board directly under the location of the replica resin transmitter. Temperatures were logged every second for 60 min to record heat transfer through the board. 25 ml of each adhesive was mixed and applied to a board. A replica transmitter was then placed on the adhesive and pushed down lightly until the adhesive started to push out from under the transmitter.



Three trials were run for all adhesives except Equi-Thane Adhere, Loctite Marine Epoxy, and Sika Pro Select due to limited supplies of each of these adhesives.



Discussion

Equi-thane Hoof Adhere was the least desirable epoxy adhesive tested due to its high heat and fast set time. This is unfortunate since it is made specifically to adhere to horse hooves.

Both Sika Pro and the Superbond are currently being used in the field. Our results show them to be the second and third, respectively, adhesives with the highest cure temperature. Loctite Marine Epoxy was included since it is specifically made for the marine environment. While it had the lowest temperature increase, set time was too long.

Our results suggest that PowerFast Pure 50+, of the epoxies tested, is the best replacement, in terms of both curing temperature and setting time, for the T308+ to use for the attachment of satellite transmitters to the carapace of sub-adult and adult Cheloniidae sea turtles.

The next step will be testing adhesion longevity and chemical leaching of the top three performing adhesives.