

Removable Encapsulants for the W76 Upgrade: MC4081-2 Clocks Encapsulated with Removable Epoxy Syntactic Foam*

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Removable encapsulants that can be easily and selectively removed to repair, replace, and upgrade components for weapon stockpile life extension have long been desired in the DOE weapons complex. We are developing removable encapsulants based on Diels-Alder reversible chemistry that are stable at normal operating conditions but dissolve in n-butanol at 90°C to allow for depotting of repairable components. MC4081-2 clock circuits were encapsulated in removable epoxy syntactic foam, thermally cycled, and depotted with electrical testing performed before and after potting, during thermal cycling, and after depotting. The encapsulation experiments were done to determine if application of the removable syntactic foam, thermal cycling, and encapsulant removal damages or causes malfunctioning of the clock circuits. MC4081-2 clocks were chosen for these experiments because they have proven to be troublesome when potted and thermally cycled with other conventional encapsulants. Results of the encapsulation experiments including processing, thermal cycling conditions and electrical testing results will be presented. The chemical mechanism employed in the removable epoxy encapsulant will be discussed. Initial results of an accelerated aging study on the removable epoxy syntactic foam will also be discussed.