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The chemistry insight: Epoxy sealant as an alternative remedial operation for well integrity

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Abstract:

Epoxy resin is commonly used in the oil and gas industry due to its excellent toughness, low shrinkage, good adhesive strength, and relatively good thermal resistance. It is used for water shutoff, zonal isolation, cementing, enhanced oil recovery, and preventing leakage in wells. This paper reviews the chemistry aspect of using an epoxy resin system as a sealant to prevent well leakage and it offers insights into the chemistry of the epoxy resin system, as applied in previous studies. The paper also unveils the reasons for the application of this system from the chemistry perspective, allowing this aspect to be better understood. Success in the investigated cases depended on the formulation design. The epoxide and hydroxyl functional groups have been found to contribute substantially to the excellent performance of the sealant system. Furthermore, the amine curing agent triggers the abrupt reaction of the oxirane ring to stabilise when the cured sealant is perfectly applied. Based on the findings, it is suggested that other types of epoxies, namely epoxidised oils, require further study. Finally, in terms of safety and sustainable energy, it is suggested that more curing agent and diluent studies are undertaken.