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P3.215 Er2O3 coatings of different structures and their corrosion resistance of type 316 stainless steel to liquid lithium

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Er2O3 coatings with different structures were deposited on type 316 stainless steel substrates by magnetron sputtering and corroded by liquid lithium for corrosion resistance study. The microstructure of the Er2O3 coatings was controlled by using two different methods, one the Er metal layer was deposited and oxidized successively, and the other directly by sputtering with Er2O3 deposition. Laser-induced breakdown spectroscopy (LIBS) technique was used to study the corrosion depth profiles represented by the longitudinal element distributions especially for that of lithium in the corroded layer of the specimens. It is observed that the Er2O3 coatings with Er metal layer being deposited and oxidized successively show an excellent corrosion resistance to the liquid lithium when corroded at 500 ℃for 250 hrs, but those prepared by directly sputtering with Er2O3 deposition show a poor corrosion resistance to the liquid lithium at the same corrosion conditions. XRD and SEM/EDX analysis for the corroded layers reveals the phase structure and morphology of the vertical sections, which gives results consistent with those obtained by LIBS analysis. Relevant model was proposed to explain the intrinsic mechanism of the difference in corrosion resistance to liquid lithium.

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