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Effects of sputtering mode on the microstructure and ionic conductivity of yttria-stabilized zirconia films T.H. YEH, R.D. LIN, B.R. CHERNG, J.S. CHERNG, Ming Chi University of Technology — The microstructure and ionic conductivity of reactively sputtered yttria-stabilized zirconia (YSZ) films in various sputtering modes are systematically studied using a closed-loop controlled system with plasma emission monitoring. A transition-mode sputtering corresponding to 45% of target poisoning produces a microstructure with ultrafine crystallites embedded in an amorphous matrix, which undergoes an abnormal grain growth upon annealing at 800°C. At 400°C, its measured ionic conductivity is higher, by about a half order of magnitude, than that of its 86%-target-poisoning counterpart, which is in turn higher than the YSZ bulk by about one order of magnitude. The abnormally-grown ultra-large grain size is believed to be responsible for the former comparison due to the suppression of the grain boundary blocking effect, while the latter comparison can be attributed to the interface effect.

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