Title: Dependences of microstructures and properties on initial tempers of creep aged 7050 aluminum alloy

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Abstract

The dependences of microstructures and properties on initial tempers of 7050 aluminum alloy under creep age forming (CAF) conditions are investigated by using transmission electron microscope (TEM), scanning electron microscope (SEM), mechanical property tests and corrosion resistance tests. Three tempers are selected as the initial tempers for CAF, viz., solution, retrogression and re-solution. The constant-stress creep aging tests are conducted under simulated CAF conditions at 165 ℃ and 250 MPa for 18 h. TEM observations show that there are obviously different initial microstructures in the alloy with various initial tempers. After creep aging, a lot of fine and homogeneous transgranular precipitates with continuous grain boundary precipitates are found in the specimen with initial temper of solution; for retrogression temper, the transgranular precipitates grow up and the spacing of discontinuous grain boundary precipitates become wider; the transgranular re-precipitation and the biggest grain boundary precipitates with the widest spacing are observed in the specimen with initial temper of re-solution. Due to the fine transgranular precipitates, the creep aged specimens with initial tempers of solution and re-solution exhibit higher mechanical properties than that of retrogression with coarse transgranular precipitates. Both the creep aged specimens with initial tempers of retrogression and re-solution have lower corrosion susceptibility due to their discontinuous grain boundary structures, while the continuous grain boundary precipitates reduce the corrosion resistance of the creep aged specimen with initial temper of solution. Combining both mechanical properties and corrosion resistances