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Ultralow temperature superplasticity in ultrafine-grained Al alloys

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Abstract: Superplasticity of materials is an important field of both basic- and applied scientific researches because it presents significant challenges in the areas of flow mechanisms and it forms the underlying basis for the commercial superplastic forming industry, as well [1]. Taking into account also the economic considerations, achieving superplastic forming at the lowest possible temperature remains a priority. Here we show some recent results [2] on superplasticity of ultrafine-grained commercial Al alloys at ultralow homologous temperature below 0.5 (i.e., below 200 °C), and its novel deformation mechanism. During the superplastic deformation, grain boundary sliding, as the main flow mechanism, is enhanced by the increased diffusion in grain boundaries, when ultrafine-grained materials have grain boundary segregation of specific alloying elements.

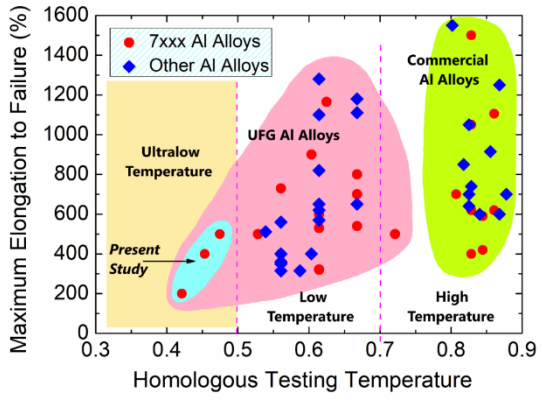

Figure 1: *Significance of the new results indicated by reviewing the temperature dependence of superplasticity of commercial Al alloys.*

Keywords*: ultralow-temperature superplasticity, Al alloys, ultrafine-garined materials, alloying segregation, high-pressure torsion.*

References:

[1] Langdon, TG, Acta Mater. 61 (2013) 7035-7046.
[2] Chinh, NQ, et al. Mater. Res. Letters 9 (2021) 475-482.