

Physico Chemical nanomaterials science

High temperature Shape Memory Effect in Co-Al Alloys

Yu.Koval¹, V.V. Odnosum¹, M.I. Savchuk², I.O. Shmatko², O.A. Shmatko²

¹Department of Phase Transformation, Institute for Metal Physics, Natl. Acad. of Sci. of Ukraine, blvd. Vernadsky, 36Kiev 03142, Ukraine
E-mail: email.of. corresponding_odnosum@imp.kiev.ua

² Department of Diffusion Processes Institute for Metal Physics, Natl. Acad. of Sci. of Ukraine, blvd. Vernadsky, 36Kiev 03142, Ukraine

Martensitic transformation and shape memory effect for Co₉₂Al₈,

Co₈₈Al₁₂, Co₈₄Al₁₆, Co₇₆Al, and pure Co are investigated. All alloys undergo martensitic transformation and demonstrate shape memory effect. Increasing of Al lead to decrease the temperature of start martensitic transformation.

It was found that solution treatment influence on parameters of martensitic transformation and shape memory effect. Annealing at 1200°C during one hour and quenching in room temperature water lead to form martensitic ε-phase. Shape memory effect was studied by equipment based on three bending test. All quenched alloys were heated with speed 10°C/min up 1000°C and cooled to -70°C. The temperatures of start martensitic transformation were found by this way. Results of this study are follows: Co₉₂Al₈ (M_H=370°C); Co₈₈Al₁₂(M_H=320°C);Co₈₄Al₁₆(M_H=210°C) Co₇₆Al₂₄(M_H=180°C) and pure Co(M_H=450°C). However clear region of the reverse transformation was not found.

Analysis of these results lead to conclusion, that reverse transformation and formation of A2 phase are developed together. This is reason unclearness of reverse transformation. Probably start of reverse transformation is negligible lower then starts temperature of A2 formation. The author of [1] informed us about similar situation in Co₇₉Al₂₁ and Co₇₇Al₂₃. Analysis our results, results works [1] and [2] shown us that addition of hot or cold rolling to solution treatment destroy A2 phase formation.

1. Niitsu K., Omori T., Nagasako M., Oikawa K., Kainuma R., Ishida K. Phase transformations in the B2 phase of Co-rich Co–Al binary alloys//Journ. of Alloys and Compounds. -2011.-**509**.-P. 2697–2702.
2. Omori T., Sutou K., Oikawa Y., Kainuma R., Ishida K. Shape Memory Effect Associated with FCC–HCP Martensitic Transformation in Co–Al// Alloys Mater. Trans.-2003.-**Vol. 44**, N12. -P. 2732 – 2735.