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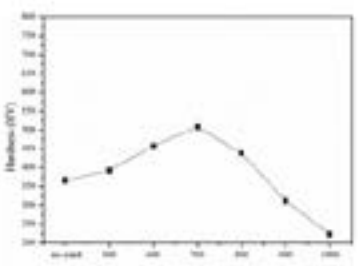
# Age heat treatments of the $CoCrFeNiTi_{0.3}$ high-entropy alloy

**Tao-Tsung Shun, Cheng-Ying Hsieh, Wei-Jhe Hung** and **Che-Fu Lee**
Feng Chia University, Taiwan

Unlike traditional alloys constituted by one or two principal elements, the high-entropy alloys are constructed by at least multi-principal elements, each with concentrations between 5 at.% and 35 at.%. These alloys exhibit good wear resistance, thermal stability, and high-temperature compressive strength, which render them promising for use as tools, molds, die, and furnace parts. Previously, we proposed that the $CoCrFeNiTi_{0.3}$ high-entropy alloy was promising for the development of a ductile, high-strength alloy owing to its high compressive stress of 1529 MPa and good fracture strain of 0.60. To further understand microstructure evolution as well as the age-hardening phenomena of this alloy, the effects of age heat treatments for 24-144 h at 500-1000$^0$C on the hardness and microstructure of as-cast $CoCrFeNiTi_{0.3}$ high-entropy alloy were reported in this paper. The results showed that the as-cast alloy displayed a dendritic structure which dendrite was a Ti-lean face-centered cubic solid solution phase (FCC1) and interdendrite consisted of three phases including a Ti-rich face-centered cubic solid solution phase (FCC2) and a mixture of (Ni,Ti)-rich h phase and (Cr,Fe)-rich s phase. After 144 h aging treatment, age-hardening was apparently observed at temperature of 600-800 $^0$C due to the transformation of FCC2 phase to h+s phases. The optimum hardness was obtained at an aging temperature of 700 $^0$C which made the hardness increase from HV366 to HV508. However, age-softening occurred at 900-1000$^0$C due to the dissolution of h+s phases. The s phase completely dissolved into FCC1 matrix at 1000$^0$C which brought the alloy hardness to the minimum HV223.



## Biography

Tao-Tsung Shun received PhD degrees from University of Utah in Metallurgical Engineering at the age of 30 years. He had worked as a senior engineer for 3 years and a researcher for 10 years in Walsin Lihwa Stainless steel Co. and Industrial Technology Research Institute, respectively. Currently, he is an associate professor in the Department of Materials Science and Engineering, Feng Chia University, Taiwan. His present research interests are in developing ductile, high strength high-entropy alloys.

ttshun@fcu.edu.tw

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