

# Curriculum Vitae

## Personal Information

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## Education

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**B.S.** Mar., 2009 – Feb., 2015

Department of Materials Science and Engineering

Korea Aerospace University

**Ph.D.** Mar., 2015 – Aug., 2019

Department of Materials Science and Engineering

Pohang University of Science and Technology (POSTECH)

**Thesis:** Phase Stability, Micromechanical Behavior, and Low-Temperature Properties in Ferrous Medium Entropy Alloys

## Experience / Career

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**Mar., 2022 – Present** Assistant Professor

Department of Metallurgical Engineering, Pukyong National University, South Korea

**Sep., 2020 – Jan., 2022** Postdoctoral Fellow

Max-Planck-Institut für Eisenforschung, Germany

**Sep., 2019 – Aug., 2020** Postdoctoral Researcher

Center for High Entropy Alloys, POSTECH, South Korea

**Mar., 2016 – Jun., 2016** Teaching Assistant

Department of Materials Science and Engineering, POSTECH, Republic of Korea

## **Awards**

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**Dec. 30<sup>th</sup>, 2022** Good Reviewer Awards

Metals and Materials International

**Feb. 25<sup>th</sup>, 2020** Acta Student Awards

Acta Materialia

**Dec. 20<sup>th</sup>, 2018** Top scholarly monographs prize

Department of Materials Science and Engineering POSTECH, Republic of Korea

**Dec. 11<sup>th</sup>, 2018** Best Poster Award

The 2<sup>nd</sup> International Conference on High-Entropy Materials, Republic of Korea

**Apr. 26<sup>th</sup>, 2018** Best Presentation Award

Korean Institute of Metals and Materials Spring Meeting, Republic of Korea

**Oct. 27<sup>th</sup>, 2017** Best Poster Award

Korean Institute of Metals and Materials Fall Meeting, Republic of Korea

**Apr. 6<sup>th</sup>, 2017** Shinhan Diamond Presentation Award

Korean Powder Metallurgy Institute Spring Meeting, Republic of Korea

**Oct. 28<sup>th</sup>, 2016** Best Poster Award

Korean Institute of Metals and Materials Fall Meeting, Republic of Korea

**Oct. 30<sup>th</sup>, 2015** Best Poster Award

Korean Institute of Metals and Materials Fall Meeting, Republic of Korea

## **Scholarship / Fellowship**

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**Sep., 2020 – Jan., 2022** Max-Planck-Institute Post-Doc. Fellowship

Max-Planck-Society, Germany

**Dec., 2019 – Dec., 2020** SeAH Haeam Post-Doc. Scholarship

SeAH Haeam Foundation, Republic of Korea



## Selected publications

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1. **J.W. Bae**, J.B. Seol, J. Moon, S.S. Sohn, M.J. Jang, H.Y. Um, B.-J. Lee, H.S. Kim, “Exceptional phase-transformation strengthening of ferrous medium-entropy alloys at cryogenic temperatures”, **Acta Materialia** 161 (2018) 388-399.
2. J.B. Seol<sup>†</sup>, **J.W. Bae**<sup>†</sup>, Z. Li, J.C. Han, J.G. Kim, D. Raabe, H.S. Kim, “Boron doped ultrastrong and ductile high-entropy alloys”, **Acta Materialia** 151 (2018) 366-376. (Co-1<sup>st</sup> author)
3. **J.W. Bae**, J.G. Kim, J.M. Park, W. Woo, S. Harjo, H.S. Kim, “*In situ* neutron diffraction study of phase stress evolution in a ferrous medium-entropy alloy under low-temperature tensile loading”, **Scripta Materialia** 165 (2019) 60-63.
4. **J.W. Bae**, H.S. Kim, “Towards ferrous medium-entropy alloys with low-cost and high-performance”, **Scripta Materialia** 186 (2020) 169-173.
5. **J.W. Bae**<sup>†</sup>, J. Lee<sup>†</sup>, A. Zargaran, H.S. Kim, “Enhanced cryogenic tensile properties with multi-stage strain hardening through partial recrystallization in a ferrous medium-entropy alloy”, **Scripta Materialia** 194 (2021) 113653. (Co-1<sup>st</sup> author)

## Research Achievements - SCI(E) Journal

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### 1<sup>st</sup> author (†: Co-1<sup>st</sup> author)

1. **J.W. Bae**, H.Y. Um, S.H. Lee, B.J. Min, S.Y. Kim, J.S. Chung, M.H. Seo, H.S. Kim, “Finite element and experimental analyses on the formability of steel sheets produced by compact endless cast and rolling”, **Metallurgical and Materials Transactions A** 48 (2017) 1021-1032.
2. **J.W. Bae**, J. Moon, M.J. Jang, D.-H. Ahn S.-H. Joo, J. Jung, D. Yim, H.S. Kim, “Deep drawing behavior of CoCrFeMnNi high-entropy alloy”, **Metallurgical and Materials Transactions A** 48A (2017) 4111-4120.
3. **J.W. Bae**, J. Moon, M.J. Jang, D. Yim, D. Kim, S. Lee, H.S. Kim, “Trade-off between tensile property and formability by partial recrystallization of CrMnFeCoNi high-entropy alloy”, **Materials Science & Engineering A** 703 (2017) 324-330.
4. J.B. Seol†, **J.W. Bae**†, Z. Li, J.C. Han, J.G. Kim, D. Raabe, H.S. Kim, “Boron doped ultrastrong and ductile high-entropy alloys”, **Acta Materialia** 151 (2018) 366-376. (Co-1<sup>st</sup> author)
5. **J.W. Bae**, J.B. Seol, J. Moon, S.S. Sohn, M.J. Jang, H.Y. Um, B.-J. Lee, H.S. Kim, “Exceptional phase-transformation strengthening of ferrous medium-entropy alloys at cryogenic temperatures”, **Acta Materialia** 161 (2018) 388-399.
6. **J.W. Bae**, J.M. Park, J. Moon, W.M. Choi, B.-J. Lee, H.S. Kim, “Effect of  $\mu$ -precipitates on the microstructure and mechanical properties of non-equiatomic CoCrFeNiMo medium-entropy alloys”, **Journal of Alloys and Compounds** 761 (2019) 75-83.
7. **J.W. Bae**, J.G. Kim, J.M. Park, W. Woo, S. Harjo, H.S. Kim, “*In situ* neutron diffraction study of phase stress evolution in a ferrous medium-entropy alloy under low-temperature tensile loading”, **Scripta Materialia** 165 (2019) 60-63.
8. **J.W. Bae**, J. Jung, J.G. Kim, J.M. Park, S. Harjo, T. Kawasaki, W. Woo, H.S. Kim, “On the phase transformation and dynamic stress-strain partitioning of ferrous medium-entropy alloy using experimentation and finite element method”, **Materialia** 9 (2020) 100619.
9. **J.W. Bae**, H.S. Kim, “Towards ferrous medium-entropy alloys with low-cost and high-performance”, **Scripta Materialia** 186 (2020) 169-173.
10. **J.W. Bae**†, J. Lee†, A. Zargaran, H.S. Kim, “Enhanced cryogenic tensile properties with multi-stage strain hardening through partial recrystallization in a ferrous medium-entropy alloy”, **Scripta Materialia** 194 (2021) 113653.
11. **J.W. Bae**, P. Asghari-Rad, A. Amanov, H.S. Kim, “Gradient-structured ferrous medium-entropy alloys with enhanced strength-ductility synergy by ultrasonic nanocrystalline surface modification”,

**Materials Science and Engineering A** 826 (2021) 141966.

## Research Achievements - SCI(E) Journal

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### Corresponding author (\*: Co-corresponding author)

1. Y.T. Choi, **J.W. Bae\***, J.M. Park, H.H. Lee, H. Kwon, S. Son, D.H. Ahn, H.S. Kim\*, “Stretch-flangeability of CoCrFeMnNi high-entropy alloy”, **Materials Science and Engineering A** 814 (2021) 141241.
2. H. Kwon, A. Zargaran, P. Asghari-Rad, E.S. Kim, G.H. Gu, J. Lee, J. Moon, **J.W. Bae\***, H.S. Kim\*, “Metastability engineering of partially recrystallized C-doped non-equiatomic CoCrFeNiMo medium-entropy alloy”, **Applied Physics Letters** 119 (2021) 141901.
3. J. Lee, **J.W. Bae\***, P. Asghari-Rad, H.S. Kim\*, “Double-humped strain hardening in a metastable ferrous medium-entropy alloy by cryogenic pre-straining and subsequent heat treatment”, **Scripta Materialia** 211 (2022) 114511.
4. H.D. Park, J.W. Won, J. Moon, H.S. Kim, H. Sung, J.B. Seol, **J.W. Bae\***, J.G. Kim\*, Fe<sub>55</sub>Co<sub>17</sub>.<sub>5</sub>Ni<sub>10</sub>Cr<sub>12</sub>.<sub>5</sub>Mo<sub>5</sub> High-Entropy Alloy with Outstanding Cryogenic Mechanical Properties Driven by Deformation-Induced Phase Transformation Behavior, **Metals and Materials International**, in pressed (2022).
5. Y.T. Choi, P. Asghari-Rad, **J.W. Bae\***, H.S. Kim\*, Effect of phase interface on stretch-flangeability of metastable ferrous medium-entropy alloys, **Materials Science and Engineering A**, 852 (2022) 143683.

## Research Achievements - SCI(E) Journal

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### Co-author

1. M.J. Jang, D.-H. Ahn, J. Moon, **J.W. Bae**, D. Yim, J.-W. Yeh, Y. Estrin, H.S. Kim, “Constitutive modeling of deformation behavior of high-entropy alloys with face-centered cubic crystal structure”, **Materials Research Letters** 5 (2017) 350-356.
2. J. Moon, S.I. Hong, **J.W. Bae**, M.J. Jang, D. Yim, H.S. Kim, “On the strain rate-dependent deformation mechanism of CoCrFeMnNi high-entropy alloy at liquid nitrogen temperature”, **Materials Research Letters** 5 (2017) 472-477.
3. D. Yim, W. Kim, S. Praveen, M.J. Jang, **J.W. Bae**, J. Moon, E. Kim, S.-J. Hong, H.S. Kim, “Shock wave compaction and sintering of mechanically alloyed CoCrFeMnNi high-entropy alloy powders”,

**Materials Science and Engineering A** 708 (2017) 291-300.

4. D. Yim, M.J. Jang, **J.W. Bae**, J. Moon, C.-H. Lee, S.-J. Hong, S.I. Hong, H.S. Kim, “Compaction behavior of water-atomized CoCrFeMnNi high-entropy alloy powders”, **Materials Chemistry and Physics** 210 (2018) 95-102.
5. J. Moon, **J.W. Bae**, M.J. Jang, S.M. Baek, D. Yim, B.-J. Lee, H.S. Kim, “Effects of homogenization temperature on cracking during cold-rolling of Al<sub>0.5</sub>CoCrFeMnNi high-entropy alloy”, **Materials Chemistry and Physics** 210 (2018) 187-191.
6. M.J. Jang, S. Praveen, H.J. Sung, **J.W. Bae**, J. Moon, H.S. Kim, “High-temperature tensile deformation behavior of hot rolled CrMnFeCoNi high-entropy alloy”, **Journal of Alloys and Compounds** 730 (2018) 242-248.
7. J.M. Park, J. Moon, **J.W. Bae**, M.J. Jang, J. Park, S. Lee, H.S. Kim, “Strain rate effects of dynamic compressive deformation on mechanical properties and microstructure of CoCrFeMnNi high-entropy alloy”. **Materials Science and Engineering A** 719 (2018) 155-163.
8. J. Moon, M.J. Jang, **J.W. Bae**, D. Yim, J.M. Park, J. Lee, H.S. Kim, “Mechanical behavior and solid solution strengthening model for face-centered cubic single crystalline and polycrystalline high-entropy alloys”, **Intermetallics** 98 (2018) 84-94.
9. J.M. Park, J. Moon, **J.W. Bae**, J. Jung, S. Lee, H.S. Kim, “Effect of annealing heat treatment on microstructural evolution and tensile behavior of Al<sub>0.5</sub>CoCrFeMnNi high-entropy alloy”, **Materials Science and Engineering A** 728 (2018) 251-258.
10. S. Praveen, **J.W. Bae**, P. Asghari-Rad, J.M. Park, “Annealing-induced hardening in high-pressure torsion processed CoCrNi medium entropy alloy”, **Materials Science and Engineering A** 734 (2018) 338-340.
11. S. Praveen, **J.W. Bae**, P. Asghari-Rad, J.M. Park, “Ultra-high tensile strength nanocrystalline CoCrNi equi-atomic medium entropy alloy processed by high-pressure torsion”, **Materials Science and Engineering A** 735 (2018) 394-397.
12. S. Praveen, **J.W. Bae**, P. Asghari-Rad, J.M. Park, J.G. Kim, H.S. Kim, “Effect of annealing on microstructure and tensile behavior of CoCrNi medium entropy alloy processed by high-pressure torsion”, **Entropy** 20 (2018) 849.
13. P. Asghari-Rad, S. Praveen, **J.W. Bae**, J. Moon, J.M. Park, A. Zargaran, H.S. Kim, “Effect of grain size on the tensile behavior of V<sub>10</sub>Cr<sub>15</sub>Mn<sub>5</sub>Fe<sub>35</sub>Co<sub>10</sub>Ni<sub>25</sub> high entropy alloy”, **Materials Science and Engineering A** 744 (2019) 610-617.
14. S. Praveen, J. Moon, **J.W. Bae**, P. Asghari-Rad, H.S. Kim, “Superior cryogenic tensile properties of ultrafine-grained CoCrNi medium-entropy alloy produced by high-pressure torsion and annealing”, **Scripta Materialia** 163 (2019) 152-156.
15. J.M. Park, J. Moon, **J.W. Bae**, D.H. Kim, Y.H. Jo, S. Lee, H.S. Kim, “Role of BCC phase on tensile behavior of dual-phase Al<sub>0.5</sub>CoCrFeMnNi high-entropy alloy at cryogenic temperature”, **Materials Science and Engineering A** 746 (2019) 443-447.
16. J.G. Kim, **J.W. Bae**, J.M. Park, W. Woo, S. Harjo, K.-G. Chin, S. Lee, H.S. Kim, “Synergetic

strengthening of layered steel sheet investigated using an *in situ* neutron diffraction tensile test”, **Scientific Reports** 9 (2019) 6829.

17. P. Sathiyamoorthi, P. Asghari-Rad, **J.W. Bae**, H.S. Kim, “Fine tuning of tensile properties in CrCoNi medium entropy alloy through cold rolling and annealing”, **Intermetallics** 113 (2019) 106578.
18. P. Sathiyamoorthi, J.M. Park, J. Moon, **J.W. Bae**, P. Asghari-Rad, A. Zargaran, H.S. Kim, “Achieving high strength and high ductility in Al<sub>0.3</sub>CoCrNi medium-entropy alloy through multi-phase hierarchical microstructure”, **Materialia** 8 (2019) 100442.
19. P. Sathiyamoorthi, P. Asghari-Rad, J.M. Park, J. Moon, **J.W. Bae**, A. Zargaran, H.S. Kim, “Exceptional cryogenic strength-ductility synergy in Al<sub>0.3</sub>CoCrNi medium-entropy alloy through heterogeneous grain structure and nano-scale precipitates”, **Materials Science and Engineering A** 766 (2019) 138372.
20. J. Moon, S.I. Hong, J.B. Seol, **J.W. Bae**, J.M. Park, H.S. Kim, “Strain-rate sensitivity of high-entropy alloys and its significance in deformation”, **Materials Research Letters** 7 (2019) 503-509.
21. P. Asghari-Rad, P. Sathiyamoorthi, **J.W. Bae**, H. Shahmir, A. Zargaran, H.S. Kim, “Effect of initial grain size on deformation mechanism during high-pressure torsion in V<sub>10</sub>Cr<sub>10</sub>Mn<sub>5</sub>Fe<sub>35</sub>Co<sub>10</sub>Ni<sub>25</sub> high-entropy alloy”, **Advanced Engineering Materials** 22 (2020) 1900587.
22. S.-H. Joo, **J.W. Bae**, W.-Y. Park, Y. Shimada, T. Wada, H.S. Kim, A. Takeuchi, T.J. Konno, H. Kato, I.V. Okulov, “Beating thermal coarsening in nanoporous materials via high-entropy design”, **Advanced Materials** 32 (2020) 1906160.
23. J.M. Park, J. Choe, J.G. Kim, **J.W. Bae**, J. Moon, S. Yang, K.T. Kim, J.-H. Yu, H.S. Kim, “Superior tensile properties of 1%C-CoCrFeMnNi high-entropy alloy additively manufactured by selective laser melting”, **Materials Research Letters** 8 (2020) 1-7.
24. P. Asghari-Rad, P. Sathiyamoorthi, N.T.C. Nguyen, **J.W. Bae**, H. Shahmir, H.S. Kim, “Fine-tuning of mechanical properties in V<sub>10</sub>Cr<sub>15</sub>Mn<sub>5</sub>Fe<sub>35</sub>Co<sub>10</sub>Ni<sub>25</sub> high-entropy alloy through high-pressure torsion and annealing”, **Materials Science and Engineering A** 771 (2020) 138604.
25. J.G. Kim, **J.W. Bae**, J.M. Park, W. Woo, S. Harjo, S. Lee, H.S. Kim, “Effect of the difference in strength of hard and soft components on the synergetic strengthening of layered materials”, **Metals and Materials International** 27 (2021) 376-383.
26. J. Moon, J.M. Park, **J.W. Bae**, H.S. Do, B.J. Lee, H.S. Kim, “A new strategy for designing immiscible medium-entropy alloys with excellent tensile properties”, **Acta Materialia** 193 (2020) 71-82.
27. J.B. Seol, **J.W. Bae**, J.G. Kim, H. Sung, Z. Li, H.H. Lee, S.H. Shim, J.H. Jang, W.-S. Ko, S.I. Hong, H.S. Kim, “Short-range order strengthening in boron-doped high-entropy alloys for cryogenic applications”, **Acta Materialia** 194 (2020) 366-377.
28. J. Moon, J.M. Park, **J.W. Bae**, N. Kang, J. Oh, H. Shin, H.S. Kim, “Hetero-deformation-induced strengthening by twin-mediated martensitic transformation in an immiscible medium-entropy alloy”, **Scripta Materialia** 186 (2020) 24-28.



29. S.A.A. Sham, G. Jang, J.W. Won, **J.W. Bae**, H. Jin, H.S. Kim, C.S. Lee, “Low-cycle fatigue properties of CoCrFeMnNi high-entropy alloy compared with its conventional counterparts”, **Materials Science and Engineering A** 792 (2020) 139661.
30. J.G. Kim, J.B. Seol, **J.W. Bae**, H.S. Kim, “On the mechanistic understanding of annealing-induced strength enhancement of ultrafine-grained high-Mn steel”, **Materialia** 13 (2020) 100837.
31. H. Kwon, J. Moon, **J.W. Bae**, J.M. Park, S. Son, H.-S. Do, B.-J. Lee, H.S. Kim, “Precipitation-driven metastability engineering of carbon-doped CoCrFeNiMo medium-entropy alloys at cryogenic temperature”, **Scripta Materialia** 188 (2020) 140-145.
32. N.T.-C. Nguyen, P. Asghari-Rad, J.W. Bae, P. Sathiyamoorthi, H.S. Kim, “Superplastic behavior in high-pressure torsion-processed  $\text{Mo}_{0.5}\text{Fe}_{55}\text{Co}_{18}\text{Cr}_{12.5}\text{Ni}_7$  medium-entropy alloy”, **Metallurgical and Materials Transactions A** 52A (2020), 1-7.
33. J. Lee, J. Moon, **J.W. Bae**, J.M. Park, H. Kwon, H. Kato, H.S. Kim, “Temperature-and strain-dependent thermally-activated deformation mechanism of a ferrous medium-entropy alloy”, **Intermetallics** 134 (2021) 107202.
34. H. Kwon, P. Asghari-Rad, J.M. Park, P. Sathiyamoorthi, **J.W. Bae**, J. Moon, A. Zargaran, Y.T. Choi, S. Son, H.S. Kim, “Synergetic strengthening from grain refinement and nano-scale precipitates in non-equiatomic CoCrFeNiMo medium-entropy alloy”, **Intermetallics** 135 (2021) 107212.
35. R. Xiong, H. Peng, T. Zhang, **J.W. Bae**, H.S. Kim, Y. Wen, “Superior strain-hardening by deformation-induced nano-HCP martensite in Fe-Mn-Si-C high-manganese steel”, **Materials Science and Engineering A** 824 (2021) 141864.
36. J. Moon, E. Tabachnikova, S. Shumilin, T. Hryhorova, Y. Estrin, J. Brechtel, P.K. Liaw, W. Wang, K.A. Dahmen, A. Zargaran, **J.W. Bae**, H.-S. Do, B.-J. Lee, H.S. Kim, “Deformation behavior of a Co-Cr-Fe-Ni-Mo medium-entropy alloy at extremely low temperatures”, **Materials Today** 50 (2021) 55-68.
37. J.M. Park, P. Asghari-Rad, A. Zargaran, **J.W. Bae**, J. Moon, H. Kwon, J. Choe, S. Yang, J.-H. Yu, H.S. Kim, “Nano-scale heterogeneity-driven metastability engineering in ferrous medium-entropy alloy induced by additive manufacturing”, **Acta Materialia** 221 (2021) 117426.
38. H. Park, J.W. Bae, T.H. Lee, I.J. Park, C. Kim, M.G. Lee, S.A. Lee, J.W. Yang, M.-J. Choi, S.H. Hong, S.Y. Kim, S.H. Ahn, J.Y. Kim, H.S. Kim, H.W. Jang, "Surface-tailored medium entropy alloys as radically low overpotential oxygen evolution electrocatalysts", **Small** 18 (2022) 2105611.
39. S.A.A. Shams, J.W. Bae, J.N. Kim, H.S. Kim, T. Lee, C.S. Lee, "Origin of superior low-cycle fatigue resistance of an interstitial metastable high-entropy alloy", **Journal of Materials Science & Technology** 115 (2022) 115-128.
40. D. Wei, L. Wang, Y. Zhang, W. Gong, T. Tsuru, I. Lobzenko, J. Jiang, S. Harjo, T. Kawasaki, J.W. Bae, W. Lu, Z. Lu, Y. Hayasaka, T. Kiguchi, N.L. Okamoto, T. Ichitsubo, H.S. Kim, T. Furuhashi, E. Ma, H. Kato, “Metalloid substitution elevates simultaneously the strength and ductility of face-centered-cubic high-entropy alloys”, **Acta Materialia** 225 (2022) 117571.
41. A. Mohammadi, M. Novelli, M. Arita, J.W. Bae, H.S. Kim, T. Grosdidier, K. Edalati, “Gradient-

structured high-entropy alloy with improved combination of strength and hydrogen embrittlement resistance", **Corrosion Science** 200 (2022) 110253.

42. A. Mohammadi, P. Edalati, M. Arita, **J.W. Bae**, H.S. Kim, K. Edalati, Microstructure and defect effects on strength and hydrogen embrittlement of high-entropy alloy CrMnFeCoNi processed by high-pressure torsion, **Materials Science and Engineering A** 884 (2022) 143179.
43. S.A.A. Shams, G. Jang, **J.W. Bae**, A. Amanov, H.S. Kim, T. Lee, C.S. Lee, Low-cycle fatigue behavior and surface treatment of a twinning-induced plasticity high-entropy alloy, **Materials Science and Engineering A**, 792 (2022) 139661.
44. D. Wei, W. Gong, T. Tsuru, I. Lobzenko, X. Li, S. Harjo, T. Kawasaki, H.-S. Do, **J.W. Bae**, C. Wagner, G. Laplanche, Y. Koizumi, H. Adachi, K. Aoyagi, A. Chiba, B.-J. Lee, H.S. Kim, H. Kato, Si-addition contributes to overcoming the strength-ductility trade-off in high-entropy alloys, **International Journal of Plasticity**, 159 (2022) 103443.

## Patents

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1. J. Moon, B.-J. Lee, **J.W. Bae**, W.M. Choi, M.J. Jang, H.S. Kim / "Method for enhancing workability of Al-containing high-entropy alloys"
  - A. Republic of Korea: 10-1950578 (Patent No.)
  - B. PCT: PCT/KR2018/003663 (Application No.)
2. J. Moon, H.S. Kim **J.W. Bae** / "Medium-entropy alloys with excellent cryogenic mechanical properties"
  - A. Republic of Korea: 10-1910744 (Patent No.)
  - B. PCT: PCT/KR2017/009364 (Application No.)
  - C. USA: 16/308517 (Application No.)
  - D. Japan: 2017/009364 (Application No.)
  - E. E.U.: 17912348.4 (Application No.)
3. H.Y. Um, H.S. Kim, **J.W. Bae**, J. Moon, W.M. Choi, B.-J. Lee, M.J. Jang, D. Yim / "Medium-entropy alloy based on iron, cobalt, nickel, and chromium and manufacturing method for the same"
  - A. Republic of Korea: 10-1913943 (Patent No.)
  - B. Republic of Korea: 10-2017-0065197 (Application No.)
4. H.S. Kim, J.B. Seol, **J.W. Bae**, J.C. Han / "High entropy alloy doped with boron and method for manufacturing the same"

- A. Republic of Korea: 10-1962229 (Patent No.)
  - B. PCT: PCT/KR2017/012543 (Application No.)
  - C. USA: 16/310855 (Application No.)
  - D. Japan: 2017-012543 (Application No.); 6839213 (Patent No.)
  - E. E.U.: 17913104.0 (Application No.)
5. H.S. Kim, J. Moon, J.M. Park, M.J. Jang, **J.W. Bae** / “Medium entropy alloy and manufacturing method for the same”
- A. Republic of Korea: 10-2178331 (Patent No.)
  - B. Republic of Korea: 10-2018-0122672 (Application No.)
6. H.S. Kim, J.G. Kim, J.M. Park, **J.W. Bae** / “High-strength and toughness medium entropy alloy and manufacturing method for the same”
- A. Republic of Korea: 10-2178332 (Patent No.)
  - B. Republic of Korea: 10-2018-0127632 (Application No.)
7. H.S. Kim, **J.W. Bae**, S.J. Son, J.M. Park, J. Moon / “Manufacturing apparatus of alloy and manufacturing method of the same”
- A. Republic of Korea: 10-2019-0053857 (Application No.)
8. H.S. Kim, H.H. Lee, J.I. Yoon, **J.W. Bae**, J. Jung, K.W. Oh, G.L. Kim, J.Y. Oh, S.T. Park, / “A method of evaluating biaxial-stretch formability of metallic sheets with a small-scale specimen”
- A. Republic of Korea: 10-2019-0060238 (Application No.)
  - B. Republic of Korea: 10-2196081 (Patent No.)
9. H.S. Kim, J.W. Bae, J.M. Park / “Method for simultaneously enhancing tensile properties and hydrogen-embrittlement resistance of additively-manufactured metallic parts”
- A. Republic of Korea: 10-2020-0147964 (Application No.)