



## Registration Form for WFC Scientific Committee

### Personal Info.

Name: Guohua Wu

Title: Professor

Affiliation: Shanghai Jiao Tong University



### Education Background

Huazhong University of Science and Technology      1997.09-2000.08  
Major in: Material Processing Engineering  
Degree: Doctor

Southeast University      1985.09-1988.06  
Major in: Material Processing Engineering  
Degree: Master

Hefei University of Technology      1981.09-1985.08  
Major in: Foundry  
Degree: Bachelor

### Working Experience

Company 1:      Shanghai Jiao Tong University  
2005.09-Now      Position: Professor  
2002.06-2005.08      Position: Associate Professor  
2000.09-2002.05      Position: Postdoctoral Researcher

### Responsibility:

1. Deputy director of National Engineering Research Center of Light Alloy Net Forming.
2. Responsible teacher for undergraduate courses "Introduction to Engineering", "Principles of Metal Liquid Forming", and "Principles of Material Processing"; Responsible teacher for the graduate course "Research and Production Practice" and "Frontier Innovation Practice", etc.
3. Doctoral supervisor and master supervisor.

### Major Achievements:

1. First Prize of National Technology Invention Awards, 2020, China.



# The 75<sup>th</sup> World Foundry Congress

## Developing Foundry

Oct.25-30, 2024  
Deyang, China

2. First Prize of National Defense Technology Invention Award, 2017, China.
3. First Prize of Shanghai Technological Invention Award, 2013, Shanghai, China.
4. Leading Talents of Shanghai, 2019, Shanghai, China.
5. International Magnesium Science & Technology Award, Innovation Research & Application Award, 2020, International Magnesium Association.
6. Outstanding Discipline Leader in Shanghai, 2008, Shanghai, China.

Company 2:                   Hefei University of Technology  
1995.12-1997.08    Position: Associate Professor  
1988.07-1995.11    Position: Lecturer

### Responsibility:

1. Director of the teaching and research section of metallurgical technology.
2. Responsible teacher for undergraduate courses “Molding Materials” and “Metallurgical Technology”.

### Major Achievements:

1. Major Science and Technology Achievement Award of Anhui province, 1989, Anhui, China.
2. The third prize of the Science and Technology Progress Award of Anhui province, 1992, Anhui, China.

### Project experience

- Project 1    2020.11-2024.12

Project information: Research on basic problems of casting light alloys with high strength and high stiffness, National Key Plan for Strengthening Infrastructure

#### Responsibility:

1. Project leader.
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

#### Achievements:

1. The structures of high-modulus solid solution and second phase of cast aluminum-lithium alloy and cast magnesium alloy are revealed, the trade-off between stiffness, strength, and plasticity in light alloys is realized, and the design criteria of high-stiffness casting light alloy with good strength and desired ductility is proposed.
2. The high-strength and high-stiffness casting aluminum-lithium alloy and high-stiffness casting magnesium alloy are developed, and the technical bottleneck of the fabrication of complex-structured aluminum-lithium casting alloy components with high chemical activity is addressed.

- Project 2    2019.12-2022.12

Project information: Controlling the forming defects and dimensions of the high-strength and heat-



resistant magnesium alloy casting with large scale and complex thin-walled structure, National Key Research & Development Program of China

Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

Achievements:

1. Currently, there is a serious lack of basic research on defects and dimension control in high-strength and heat-resistant magnesium alloys. In this project, the relationship between casting defects and solidification characteristics/component structure/casting process/alloy composition/mold materials, as well as the formation mechanism of defects were investigated;
2. The methods of prediction and controlling the casting defect are proposed, and the manufacturing of typical components is realized.

- Project 3 2021.03-2024.12

Project information: Mechanism of the compound treatment of the magnesium rare-earth alloy melt with high melting capacity, National Natural Science Foundation Integration Project

Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

Achievements:

1. Three key factors including melt homogenization, purification, and grain refinement treatment that determine the quality of the melt under high melting capacity conditions are studied. The interaction between the chemical and physical metallurgical reactions within the melt was systematically analyzed. Based on the above studies, the mechanism of synergistic control of melt preparation quality was revealed.
2. An efficient compound flux for both purification and grain refinement is designed, and a technical prototype for compound melt treatment of magnesium rare-earth alloy with high melting capacity is proposed.

- Project 4 2018.11-2020.10

Project information: Magnesium-lithium matrix composites with high stiffness, good strength, and desired toughness, National Frontier Innovation Special Zone Plan

Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

Achievements:

1. The effects of different rare-earth elements on the microstructure and mechanical properties of Mg-Li alloy are investigated, and the design and development of Mg-Li-RE base alloy are realized.
2. The strengthening and toughening mechanism of Mg-Li-RE matrix composites is studied, the preparation technology of micro- and nano-sized particle-reinforced Mg-Li-RE matrix



composites is overcome, and the composite forming technology of Mg-Li-RE matrix composites is developed.

- Project 5 2018.01-2021.12

Project information: Basic study on rheological forming near liquidus temperature of flame-retardant magnesium alloys with high Ca content, National Natural Science Foundation of China

Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

Achievements:

1. The evolution mechanism of the non-dendritic microstructure of AZ91-Ca flame-retardant magnesium alloy in the preparation of semi-solid slurry by gas stirring is revealed, and the solidification behavior of the remaining liquid phase under high pressure and high cooling rate during rheological extrusion casting was studied. The strengthening mechanism of casting magnesium alloy fabricated by rheological extrusion was investigated.
2. A new semi-solid rheological forming method and equipment system for flame-retardant magnesium alloys were developed, and an effective technical approach to improve the mechanical properties of flame-retardant magnesium alloys was proposed.

- Project 6 2016.07-2020.06

Project information: Development and demonstration application of high-performance magnesium alloy, National Key R&D Plan

Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

Achievements:

1. Four kinds of high-performance magnesium alloys have been developed, i.e. high-strength cast magnesium alloy, high-strength wrought magnesium alloy, high-plasticity cast magnesium alloy, and high-plasticity wrought magnesium alloy. The mechanical properties of the developed magnesium alloys have met the technical requirements.
2. The preparation technologies of high-quality magnesium alloy are developed, including melt purification and compound grain refinement treatment. The above technologies are used in the fabrication of three types of components, i.e. spacecraft cabin casting, automobile seat frame casting, and wrought anti-collision beam parts, and the performance evaluation of the whole component is completed.

- Project 7 2015.06-2016.12

Project information: Research on application technology of light-weight, high-strength, and heat-resistant magnesium alloy in aircraft structural parts, National High Technology Research and Development Program of China

Responsibility:



# The 75<sup>th</sup> World Foundry Congress

## Developing Foundry

Oct.25-30, 2024  
Deyang, China

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

### Achievements:

1. The bottleneck of the low elongation of magnesium alloys with a high content of heavy rare earth is overcome, and the problem of coarse microstructure in large and complex frame castings formed under the slow cooling rate during resin sand casting is solved.
2. A series of stable low-pressure sand mold precision forming technologies of magnesium rare-earth alloy have been developed, which provides strong technical support for expanding the application of high-strength and heat-resistant magnesium alloy castings in the main load-bearing components of spacecraft.

- Project 8 2013.01-2016.12

Project information: Basic research on the preparation of magnesium alloy semi-solid slurry by pulse current and rheological forming, National Natural Science Foundation of China

### Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

### Achievements:

1. The relationship between the microstructures of the casting and the semi-solid slurry treated with pulse current is revealed, and the effect of alloying elements on the formation, spheroidization, and coarsening of solid particles is clarified. The compound influence and its mechanism of Zr alloying and pulse current on the semi-solid slurry are studied.
2. The semi-solid casting process of magnesium alloy has been optimized, and a new method for preparing a semi-solid slurry of magnesium alloy is developed. An effective technical approach has been developed to improve the mechanical properties of magnesium alloy fabricated using semi-solid casting.

- Project 9 2007.07-2011.12

Project information: Basic research on melt purification of magnesium alloy, National Major Basic Research Program

### Responsibility:

1. Project leader
2. Project planning, organization, the proposal of research ideas, research schemes, and technology roadmap, etc.

### Achievements:

1. A design principle for high-efficiency flux was proposed for several typical magnesium alloys, and a high-efficiency purification flux for magnesium alloys was developed. The purification mechanism of the flux refining is clarified. The removal mechanisms of impurity and gas by using non-flux purification, e.g. gas purification and filtration purification, are also studied, and the technical prototype of non-flux purification is developed.



**Other Items (can be sent as an attachment)**

1. Publications: papers, books, patents (including publication name, time, and your responsibility, etc.)

● Papers

- (1) **Guohua Wu\***, Cunlong Wang, Ming Sun, Wenjiang Ding, Recent developments and applications on high-performance cast magnesium rare-earth alloys, *Journal of Magnesium and Alloys*, 9 (2021) 1-20.
- (2) Hao Ji, **Guohua Wu\***, Wencai Liu, Xiaolong Zhang, Liang Zhang, Mingxu Wang, Origin of the age-hardening and age-softening response in Mg-Li-Zn based alloys, *Acta Materialia*, 226, (2022) 117673.
- (3) Xin Tong, **Guohua Wu\***, Mark A. Easton, Ming Sun, David H. StJohn, Rui Jiang, Fangzhou Qi, Exceptional grain refinement of Mg-Zr master alloy treated by tungsten inert gas arc re-melting with ultra-high frequency pulses, *Scripta Materialia*, 215 (2022) 114700.
- (4) Xin Tong, **Guohua Wu\***, Mark A. Easton, Ming Sun, Qiman Wang, Liang Zhang, Microstructural evolution and strengthening mechanism of Mg-Y-RE-Zr alloy fabricated by directed energy deposition, *Additive Manufacturing*, 67 (2023) 103487.
- (5) Xin Tong, **Guohua Wu\***, Liang Zhang, Yingxin Wang, Wencai Liu, Wenjiang Ding, Microstructure and mechanical properties of repair welds of low-pressure sand-cast Mg-Y-RE-Zr alloy by tungsten inert gas welding, *Journal of Magnesium and Alloys*, 10 (2022) 180-194.
- (6) He Xie, **Guohua Wu\***, Xin Tong, Rui Jiang, Liang Zhang, Wencai Liu, The opposite effect of  $\beta_1/\beta''$  on the ductility of aged Mg - 3Nd - 3Gd - 0.2Zn - 0.5Zr alloy, *Journal of Materials Science and Technology*, 149 (2023) 67-72.
- (7) Xiang Peng, Wencai Liu, **Guohua Wu\***, Hao Ji, Wenjiang Ding, Plastic deformation and heat treatment of Mg-Li alloys: a review, *Journal of Materials Science and Technology*, 99 (2021) 193-206.
- (8) Jinshuo Zhang, **Guohua Wu\***, Liang Zhang, Xiaolong Zhang, Chuchang Shi, Xin Tong, Addressing the strength-ductility trade-off in a cast Al-Li-Cu alloy—Synergistic effect of Sc-alloying and optimized artificial ageing scheme, *Journal of Materials Science and Technology*, 96 (2021) 212-225.
- (9) Wencai Liu, Beiping Zhou, **Guohua Wu\***, Liang Zhang, Xiang Peng, Liang Cao, High temperature mechanical behavior of low-pressure sand-cast Mg - Gd - Y - Zr magnesium alloy, *Journal of Magnesium and Alloy*, 4 (2019) 597-604.
- (10) Kang Luo, Liang Zhang, **Guohua Wu\***, Wencai Liu, Wenjiang Ding, Effect of Y and Gd content on the microstructure and mechanical properties of Mg - Y - RE alloys, *Journal of Magnesium and Alloys*, 2 (2019) 345-354.
- (11) Xiaolong Zhang, **Guohua Wu\***, Liang Zhang, Chunchang Shi, Effects of Mg and Sc additions on the microstructure, mechanical properties, and thermal stability of a cast Al-2Li-2Cu-0.2Zr alloy after thermal exposure, *Journal of Alloys and Compounds*, 788 (2019) 367-382.
- (12) Yanlei Li, **Guohua Wu\***, Antao Chen, Wencai Liu, Yingxin Wang, Liang Zhang, Effects of processing parameters and addition of flame-retardant into moulding sand on the microstructure and fluidity of sand-cast magnesium alloy Mg-10Gd-3Y-0.5Zr, *Journal of Materials Science and Technology*, 33 (2017) 558-566.



- (13) H.R. Jafari Nodooshan, **Guohua Wu\***, Wencai Liu, Guangling Wei, Yanlei Li, Effect of Gd content on high temperature mechanical properties of Mg–Gd–Y–Zr alloy, *Materials Science and Engineering A*, 651 (2016) 840–847.
- (14) Yushi Chen, Liang Zhang, Wencai Liu, **Guohua Wu\***, Wenjiang Ding, Preparation of Mg–Nd–Zn–(Zr) alloys semisolid slurry by electromagnetic stirring, *Materials and Design*, 95 (2016) 398–409.
- (15) Yang Zhang, Jie Zhang, **Guohua Wu\***, Wencai Liu, Liang Zhang, Wenjiang Ding, Microstructure and tensile properties of as-extruded Mg–Li–Zn–Gd alloys reinforced with icosahedral quasicrystal phase, *Materials and Design*, 66 (2015) 162–168.
- (16) Cunlong Wang, Antao Chen, Liang Zhang, Wencai Liu, **Guohua Wu\***, Wenjiang Ding, Preparation of an Mg–Gd–Zn alloy semisolid slurry by low frequency electro-magnetic stirring, *Materials and Design*, 84 (2015) 53–63.
- (17) Cunlong Wang, Jichun Dai, Wencai Liu, Liang Zhang, **Guohua Wu\***, Effect of Al additions on grain refinement and mechanical properties of Mg–Sm alloys, *Journal of Alloys and Compounds*, 620 (2015) 172–179.
- (18) Yang Zhang, **Guohua Wu\***, Wencai Liu, Liang Zhang, Song Pang, Wenjiang Ding, Microstructure and mechanical properties of rheo-squeeze casting AZ91-Ca magnesium alloy prepared by gas bubbling process, *Materials and Design*, 67 (2015) 1–8.
- (19) Yang Zhang, **Guohua Wu\***, Wencai Liu, Liang Zhang, Song Pang, Yingdong Wang, Wenjiang Ding, Effects of processing parameters and Ca content on microstructure and mechanical properties of squeeze casting AZ91-Ca alloys, *Materials Science and Engineering A*, 595 (2014) 109–117.
- (20) Cunlong Wang, **Wu Guohua\***, Min Sun, Liang Zhang, Wencai Liu, Wenjiang Ding, Formation of Non-dendritic Microstructures in Preparation of Semi-solid Mg-RE Alloys Slurries: Roles of RE Content and Cooling Rate, *Journal of Materials Processing Technology*, 279 (2020) 116545.

● Books

- (1) Fusheng Pan and Guohua Wu, et al., *New alloy material - magnesium alloy*, China Railway Publishing House, China, November 2017, responsible for the section "Cast magnesium alloy".
- (2) Wenjiang Ding, et al., *Science and technology of magnesium alloy*, Science Press, China, January 2007, responsible for the section "Melt purification of magnesium alloy".
- (3) Shenglong Dai and Wenjiang Ding, et al., *Foundry Handbook (Volume 3) - Casting of Non-Ferrous Alloys*, China Machine Press, China, June 2021, responsible for the section "Cast Magnesium Alloys".
- (4) Lixia Kang and Jie Gao, et al., *Handbook of New Materials for Aviation Transmission*, Aviation Industry Press, China, November 2020, responsible for the section "Magnesium Alloy".

● Patents

- (1) **Guohua Wu**, Wenjiang Ding, Hongtao Gao, Refining flux of magnesium rare-earth alloy and its fabrication method, Chinese invention patent, ZL 200410017012, 12<sup>th</sup> January 2005.
- (2) **Guohua Wu**, Wenjiang Ding, Refining flux of Mg-Gd-Y-Zr alloy and its fabrication method,





- Chinese invention patent, ZL 200810036573, 10<sup>th</sup> September 2008.
- (3) **Guohua Wu**, Wenjiang Ding, Liming Peng, Magnesium melt purification device, Chinese invention patent, ZL 200910048993, 16<sup>th</sup> September 2009.
  - (4) **Guohua Wu**, Wencai Liu, Longkang Jiang, Guangling Wei, Wenjiang Ding, Heat treatment methods for Mg-Gd-Y-Zr magnesium alloys and their large and complex castings, Chinese invention patent, ZL 201310304008, 13<sup>th</sup> November 2013.
  - (5) **Guohua Wu**, Hao Ji, Wencai Liu, Dehua Ding, Guanglan Liao, An AlN reinforced magnesium-lithium based composite and its preparation method, Chinese invention patent, ZL 202010327514, 19<sup>th</sup> June 2020.
  - (6) **Guohua Wu**, Song Pang, Wencai Liu, Peng Zhang, Wenjiang Ding, Method and device for preparing semi-solid metal slurry/billet by electric current, Chinese invention patent, ZL 201110357924, 11<sup>th</sup> April 2012.
  - (7) Guoqing Zhang, **Guohua Wu**, Xin Tong, Liang Zhang, Xiaolong Zhang, A kind of magnesium rare earth alloy repair welding wire and its preparation and repair welding method, Chinese invention patent, ZL 202110413718, 23<sup>rd</sup> July 2021.
  - (8) Guoqing Zhang, **Guohua Wu**, Xin Tong, Liang Zhang, Xiaolong Zhang, A kind of heat treatment method to suppress abnormal grain coarsening in Mg-Y-RE alloy repair welding joints, Chinese invention patent, ZL 202110411686, 30<sup>th</sup> July 2021.
  - (9) Xin Tong, **Guohua Wu**, Liang Zhang, A pretreatment method for Mg-Zr master alloy to improve the grain refinement efficiency of magnesium alloys, Chinese invention patent, ZL 202010616056, 3<sup>rd</sup> November 2020.
  - (10) Jichun Dai, **Guohua Wu**, Wencai Liu, Ming Sun, Wenjiang Ding, Preparation method of high-strength cast magnesium alloy, Chinese invention patent, ZL 201210041192, 4<sup>th</sup> July 2012.
  - (11) Wencai Liu, Guohua Wu, Guangling Wei, Wenjiang Ding, A high-strength and high-modulus cast magnesium rare-earth alloy and its preparation method, Chinese invention patent, ZL 201510334807, 23<sup>rd</sup> September 2015.
  - (12) Song Pang, **Guohua Wu**, Wencai Liu, Wenjiang Ding, Protection device of magnesium alloy melt, Chinese invention patent, ZL 201110356446, 28<sup>th</sup> March 2012.
  - (13) Wencai Liu, **Guohua Wu**, Xiangjuan Chen, Wenjiang Ding, A method for grain refinement of magnesium alloy by zirconium, Chinese invention patent, ZL 201510334806, 23<sup>th</sup> September 2015.
  - (14) Yanlei Li, **Guohua Wu**, Yingxin Wang, Antao Chen, Wencai Liu, Flame-retardant and high deformability casting sand and its preparation method, Chinese invention patent, ZL 201610459852, 28<sup>th</sup> September 2016.
  - (15) Yanlei Li, **Guohua Wu**, Yingxin Wang, Antao Chen, Wencai Liu, Self-hardening flame-retardant transfer coating and its preparation method for magnesium alloy sand casting, Chinese invention patent, ZL 201610756325, 4<sup>th</sup> January 2017.
  - (16) Antao Chen, Liang Zhang, **Guohua Wu**, Yanlei Li, Wenfei Mo, Guangling Wei, Lightweight high-strength cast aluminum–lithium alloys and its preparation method, Chinese invention patent, ZL 201410674805, 25<sup>th</sup> March 2015.
  - (17) Fang Qi, Liang Zhang, **Guohua Wu**, Wencai Liu, Xiaolong Zhang, Wenjiang Ding, Corrosion resistant casting Aluminium–lithium alloys and its preparation method, Chinese invention patent, ZL 201910178122, 12<sup>th</sup> July 2019.





- (18) Liang Zhang, **Guohua Wu**, Antao Chen, Wencai Liu, Guangling Wei, Methods of improving the plasticity of cast Aluminium–lithium alloys, Chinese invention patent, ZL 201711100440, 6<sup>th</sup> April 2018.
  - (19) Yu Peng, Liang Zhang, **Guohua Wu**, Antao Chen, Wencai Liu, Chunchang Shi, Xiaolong Zhang, Heat treatment method of casting Aluminium–lithium alloys with high lithium content, Chinese invention patent, ZL 201610458013, 21<sup>st</sup> September 2016.
  - (20) Xiaoxiang Zhong, Liang Zhang, **Guohua Wu**, Wencai Liu, Xiaolong Zhang, Wenjiang Ding, Multilayer composite mold coating for sand casting of Aluminium–lithium alloys and its application method, Chinese invention patent, ZL 202010026112, 1<sup>st</sup> May 2020.
2. Experience in foundry standards formulation
- (1) "Cast Magnesium Alloy Ingot", National Standard of the People's Republic of China, GB/T 19078-2016.
  - (2) "Test Method for Purity of Magnesium and Magnesium Alloy Ingots", National Standard of the People's Republic of China, GB/T 38786-2020.
3. Speech experience at academic conference (including conference title, date, speech topic, etc.)
- (1) "Research and application status and the prospect of cast aluminum – lithium alloys", The 7th International Symposium on Non-Ferrous Alloys and Special Casting Technologies, 21st April 2023, Shenyang, China
  - (2) "Research and application status and the prospect of cast aluminum – lithium alloys", International Forum on Advanced Material, 23rd September 2021, Ningbo, China
  - (3) "Development of new high-strength and heat-resistant magnesium rare-earth alloy components and their application in aerospace defense equipment", 2020 National Magnesium Industry Conference, 21st September 2020, Xiaoyi, China
  - (4) "Current status and prospects of research and application of magnesium alloys in the aerospace field", 2020 China Foundry Conference, 8th November 2020, Hefei, China
  - (5) "Current status and prospects of research and application of light alloy structural materials in the aerospace field", Third National Symposium on the Science and Technology Development of Light Alloy Materials, 12th April 2019, Guangzhou, China