Advances in Automobile Engineering
ISSN: 2167-7670

Deng et al., Adv Automob Eng 2017, 6:3
DOI: 10.4172/2167-7670.1000168

Commentary OMICS International

Grain Refinement-Plastic Deformation -Texture of Bearing Ring Blank in Cold Ring Rolling

Song Deng[1,2,4], Huajie Mao[3]*and Dafang Shi[4]

[1]School of Automotive Engineering, Hubei Key Laboratory of Advanced Technology of Automotive parts, Wuhan University of Technology, P.R. China
[2]Hubei Collaborative Innovation Center for Automotive Components Technology, Wuhan University of Technology, P.R.China
[3]School of Materials Science and Engineering, Wuhan University of Technology, P.R. China
[4]Zhejiang Tianma bearing Co. Ltd., Hangzhou, P.R. China

Short Commentary

Ring rolling is a process for creating seamless ring-shaped components using specialized equipment and forming process because of its technological superiorities of high quality, high efficiency and low consuming in energies and materials [1]. According to the international trend of cooperative control of the geometric accuracy and microstructure performance in ring rolling, rolling forming criteria such as biting-in condition, plastic penetrating condition, and plastic deformation were considered comprehensively to manufacture the bearing rings [2,3]. The evolution rules of grain refinement, plastic damage, and texture of bearing ring in ring rolling compatible with the rolling forming criteria are required for the cooperative control of the geometric accuracy and microstructure performance [4,5].

To realize the cooperative control of the geometric accuracy and microstructure performance of the bearing ring, several rules of the bearing ring formation need to be revealed. Firstly, the constitutive equation of the material used for the bearing ring manufacture is crucial to study the deformation and microstructure evolution of bearings. At present, the high temperature flow stress strain relation, austenite grain growth behaviour, volume fraction and grain size of the recrystallization are still the most important research points for the constitutive equation of the material.

The mechanical conditions of rolling forming and the rules of geometric formation of bearing rings are also important and widely studied such as ring rolling theory [6,7], rolling forming process [8], process tooling [9], and forming equipment [10]. Moreover, many studies revealed the evolution rules of grain refinement, content and stability of retained austenite, and micro texture of bearing rings in ring rolling [11-13]. The effect mechanism of the rolling process parameters on the microstructure evolution and mechanical properties of bearing rings is also established [14,15]. Thirdly, some studies reported how the heat treatment process effects the microstructure evolution and mechanical properties of bearing rings [16,17].

The above research results could hardly provide the optimal rolling technical route to realize the cooperative control of the geometric accuracy and microstructure performance of bearing rings. Further experimental and theoretical studies and numerical calculation may be needed for establishing the quantitative correlation mechanism of rolling technical route with geometric formation, fine crystalline microstructure and high toughness of bearing rings.

Further, it is important to form the cooperative control mechanism of ring rolling process and heat treatment process to obtain the fine crystalline microstructure and high toughness of bearing rings. Future studies should be carried on along the above ideas to solve the optimal ring rolling-heat treatment route realizing the cooperative control of the geometric accuracy and microstructure performance of bearing rings.

References

1. Han X, Hua L, Zhou G, Wang X, Lu B (2017) An innovative eccentric ring rolling method for fabricating eccentric rings. IJMS 120: 120-135.
2. Hua L, Zhao ZZ (1997) The extremum parameters in ring rolling. J Mater Process Technol 69: 273-276.
3. Hua L, Qian DS, Pan LB (2008) Analysis of plastic penetration in process of groove ball-section ring rolling. J Mech Sci Technol 22: 1374-1382.
4. Guo J, Qian D, Deng J (2016) Grain refinement limit during hot radial ring rolling of as-cast GCr15 steel. J Mater Process Technol 231: 151-161.
5. Qian DS, Wang KW, Liu QL, Hua L (2016) Effect of annealing parameters on microstructure and mechanical property of hot-rolled 100Cr6 bearing ring. J Mater Sci Technol 32: 1086-1093.
6. Han X, Hua L, Zhou G, Lu B, Wang X (2014) FE simulation and experimental research on cylindrical ring rolling. J Mater Process Technol 214: 1245-1258.
7. Zhou G, Hua L, Lan J, Qian DS (2011) 3D coupled thermo-mechanical FE modelling and simulation of radial-axial ring rolling. Mater Res Innovations 15: 221-224.
8. Han X, Hua L, Zhou G, Lu B, Wang X (2014) A new cylindrical ring rolling technology for manufacturing thin-walled cylindrical ring. IJMS 81: 95-108.
9. Qian DS, Zhang ZQ, Hua L (2014) An advanced manufacturing method for thick-wall and deep-groove ring-Combined ring rolling. J Mater Process Technol 213: 1258-1267.
10. Wang XK, Hua L (2013) Modeling of on-line measurement for rolling the rings with blank size errors in vertical hot ring rolling process. Int J Adv Manuf Tech 68: 257-262.
11. Fei Y, Lin H, Huajie M, Xinghui H (2013) Constitutive modeling for flow behavior of GCr15 steel under hot compression experiments. Mater. Des 43: 393-401.
12. Du ZX, Xiao SL, Shen YP, Liu JS, Liu J, et al. (2015) Effect of hot rolling and heat treatment on microstructure and tensile properties of high strength beta titanium alloy sheets. Mater Sci Eng A 631: 67-74.
13. Song HY, Liu HT, Lu HH, Li HZ, Liu WQ, et al. (2014) Effect of hot rolling reduction on microstructure, texture and ductility of strip-cast grain-oriented silicon steel with different solidification structures. Mater Sci Eng A 605: 260-269.
14. Huang C, Zhang C, Jiang L, Yang Y, Liu Y (2016) Isothermal heat treatment of a bearing steel for improved mechanical properties. J Alloys Compd 660: 131-135.
15. Perez M, Sidoroff C, Vincent A, Esnouf C (2009) Microstructural evolution of

***Corresponding author:** Huajie Mao, School of Materials Science and Engineering, Wuhan University of Technology, P.R. China, Tel: +86-15926452706; E-mail: guoheng0722@126.com

Received August 08, 2017; **Accepted** August 28, 2017; **Published** September 02, 2017

Citation: Deng S, Mao H, Shi D (2017) Grain Refinement-Plastic Deformation -Texture of Bearing Ring Blank in Cold Ring Rolling. Adv Automob Eng 6: 168. doi: 10.4172/2167-7670.1000168

martensitic 100Cr6 bearing steel during tempering: From thermoelectric power measurements to the prediction of dimensional changes. Acta Mater 57: 3170-3181.

16. Golchin S, Avishan B, Yazdani S (2016) Effect of 10% ausforming on impact toughness of nano bainite austempered at 300°C. Mater Sci Eng A 656: 94-101.

17. Zolotorevsky NY, Panpurin SN, Zisman AA, Petrov SN (2015) Effect of ausforming and cooling condition on the orientation relationship in martensite and bainite of low carbon steels. Mater Charact 107: 278-282.

Citation: Deng S, Mao H, Shi D (2017) Grain Refinement-Plastic Deformation -Texture of Bearing Ring Blank in Cold Ring Rolling. Adv Automob Eng 6: 168. doi: 10.4172/2167-7670.1000168