

---

# STUDY OF VACUUMIZING AND HEAT PROCESSES OF MULTILAYER STEEL BLOCKS FOR PRODUCTION OF ULTRAFINE SHEET MATERIALS

E.A. Salmanov  
S.D. Skachkov

elmar.salmanov.94@mail.ru  
seroe\_pepsi@mail.ru

Bauman Moscow State Technical University, Moscow, Russian Federation

---

## Abstract

*The study tested the processes of vacuumizing and heat of multilayer materials of steel blocks for production of ultrafine sheet materials. We also examined the effect of temperature on the degree of vacuum while heating and vacuumizing the workpiece in preparing the materials for rolling*

## Keywords

*Composite materials, ultrafine structure, batch rolling*

© Bauman Moscow State Technical University, 2016

---

## References

- [1] Kobelev A.G., Lysak V.I., Chernyshov V.N. et al. Proizvodstvo sloistykh kompozitsionnykh materialov [Laminar composite production]. Moscow, Internet-Inzhiniring Publ., 2002. 496 p. (in Russ.).
- [2] Kolesnikov A.G., Mechiev Sh.T., Panova I.Yu. Future trends of multilayer metallic blanks. Zagotovitel'nye proizvodstva v mashinostroenii [Blanking Productions in Mechanical Engineering], 2008, no. 1, pp. 42–43 (in Russ.).
- [3] Kolesnikov A.G., Plokhikh A.I., Komissarchuk Yu.S., Mikhal'tsevich I.Yu. A study of special features of formation of submicro- and nanosize structure in multilayer materials by the method of hot rolling, MiTOM, 2010, no. 6, pp. 44–49. (in Russ.). (Eng. version of journal: Metal Science and Heat Treatment, 2010, vol. 52, no. 5, pp. 273–278. DOI: 10.1007/s11041-010-9266-x)
- [4] Kolesnikov A.G., Plokhikh A.I., Mechiev Sh.T., Mikhal'tsevich I.Yu. Sposob polucheniya metallicheskich listov so stabil'noy submikro- i nanorazmernoy strukturoy. Pat. RF 2380234. [Producing technique for metal sheet with stable submicro- and nanostructure. Patent RF 2380234]. From 08.08.2008. (in Russ.).
- [5] Aryulin S.B., Khalipov I.V. Preparation of multilayer composite materials by hot rolling. Zagotovitel'nye proizvodstva v mashinostroenii [Blanking Productions in Mechanical Engineering], 2013, no. 7, pp. 31–35 (in Russ.).
- [6] Kolesnikov A.G., Plokhikh A.I., Shinkarev A.S., Mironova M.O. Steel multilayer material rolling. Zagotovitel'nye proizvodstva v mashinostroenii [Blanking Productions in Mechanical Engineering], 2013, no. 8, pp. 39–42 (in Russ.).
- [7] Sheshin E.P. Osnovy vakuumnoy tekhniki [Basics of vacuum techniques]. Moscow, MIPT Publ., 2001. 124 p. (in Russ.).

**Salmanov E.A.** — student of the Department of Rolling equipment and technology, Bauman Moscow State Technical University, Moscow, Russian Federation.

**Skachkov S.D.** — student of the Department of Rolling equipment and technology, Bauman Moscow State Technical University, Moscow, Russian Federation.

**Scientific advisor** — A.S. Shinkarev, Cand. Sci. (Eng.), Assist. Professor of the Department of Rolling equipment and technology, Bauman Moscow State Technical University, Moscow, Russian Federation.

---