CENTRAL ASIAN JOURNAL OF MATHEMATICAL THEORY AND COMPUTER SCIENCES

https://cajmtcs.centralasianstudies.org

Volume: 04 Issue: 02 | February 2023 **ISSN: 2660-5309**

Development of Technology for the Manufacture of Porous Permeable Materials with Anisotropic Pore Structure by Vibration Molding

G‘ayratov Jasurbek G‘ayratjon o‘g‘li

Assistent, Fergana polytechnic institute, Fergana, Uzbekistan,
j.gayratov@ferpi.uz

Olimjonov Asrorbek Oybek o'g'li, Luqmonjonov Asadbek Bahodirjon o'g'li

Student of Fergana polytechnic institute, Uzbekistan, Fergana

Abstract

This article provides information on the industrial use of porous permeable materials and their chemical, physical and mechanical properties. The use of various methods and production methods to improve the operational properties of porous permeable materials and their effectiveness has been analyzed.

ARTICLE INFO

Article history:
Received 28 Dec 2022
Revised form 25 Jan 2023
Accepted 27 Feb 2023

Key words:
porous permeable materials, structural properties, coarse powder, fine powder, acceleration of vibration, frequency.

---***---

Porous permeable materials (PPM) on a metal basis have many advantages over paper, glass, ceramic, fabric and other permeable materials. They are more durable, resistant to corrosion, can work in a wide temperature range, are easily machined and welded, have high thermal and electrical conductivity, and allow regeneration.

To improve the operational properties of PPM, various methods and manufacturing methods are used (deformation of sintered blanks, freely poured powder into a mold, vibrational powder molding and deposition of fine powders into a pre-sintered workpiece and electric pulse sintering, etc.). The use of such materials as filter elements allows to increase the service life, reduce dimensions and weight.

The conducted comprehensive studies allowed us to develop a new technological process for regulating hydraulic and mechanical properties in porous permeable materials (PPM), which allows to obtain products with increased permeability and mechanical strength at a given pore size.

Based on the results of the research, a new technological process has been developed - vibration molding, which allows to obtain PPM with increased permeability and dirt capacity. The technological process is based on the segregation of the powder. By mathematical processing of the curves presented in Fig.1, the following regression dependences of the range of oscillation parameters were obtained, at which the segregation of particles by size occurs:

$$3,96*exp*0,0103f \le a \le 8,78*exp*0,012f$$

where a - is the acceleration of vibration, m/s^2; f is the frequency of vibration, Hz. For the technology of obtaining anisotropic PPM, the region II, in which the segregation of particles by size is observed, is of the greatest interest.

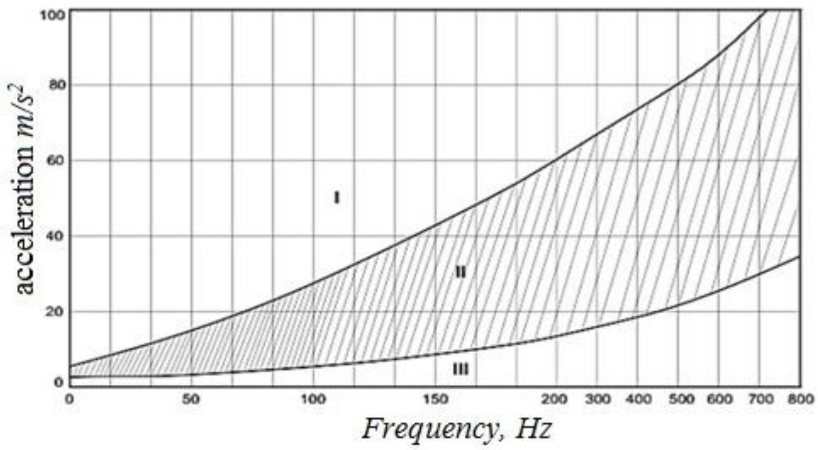


Fig.1. Behavior of powder particles depending on vibration parameters:

I - compaction, II— segregation, III– vibration boiling

The technological process includes such basic operations as preparation of initial powders (selection of chemical and granulometric compositions) and dosage of their fractions, vibrational molding and sintering, control of the operational properties of PPM. Fig.2.

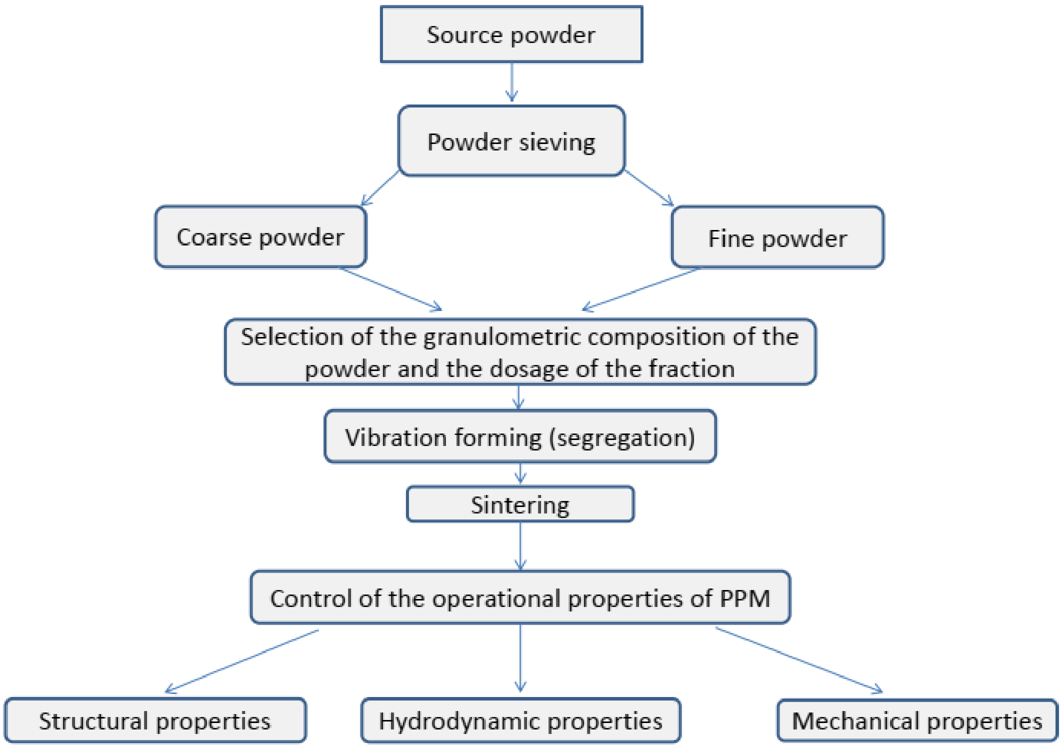
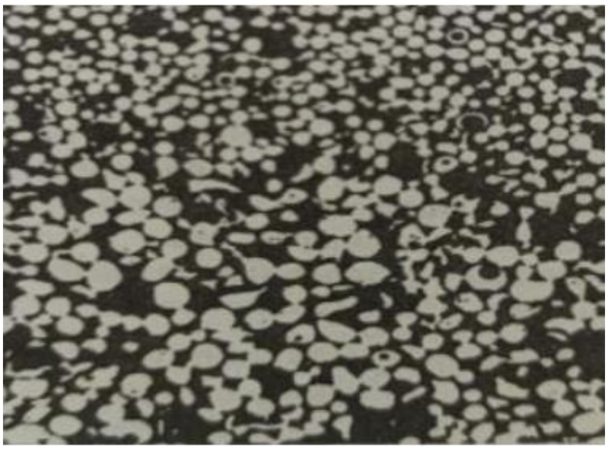
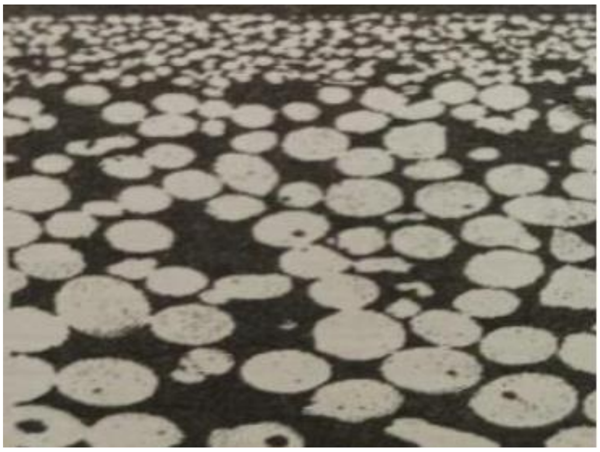


Fig.2. Scheme of the technology of obtaining PPM by vibroforming.

Fig. 3 shows the structure of the PPM obtained by sintering freely poured powder into form a) and vibroforming from bronze powder of the brand БрОФ-10-1.



a) x250



b) x500

Fig.3. The structure of the PPM obtained by sintering freely poured powder into the mold a) and vibroforming from bronze powder of the brand БрОФ-10-1 b) particle sizes (+800-1000) microns, (+200-250) microns, (+100-125) microns, (+45-63) microns

The performance characteristics of PPMS with a given pore size $D_{sr}=20$ (*mkm)* microns obtained by vibration molding and free-fill sintering are presented in the table.

Comparison of the characteristics of HIM from bronze powder *БрОФ-10-1*, obtained by vibration molding and free-fill sintering

Table

Basic properties	Sintering by free filling	Vibration forming
Average pore size, not more than, *mkm*	20	20
Maximum pore size. no more than, *mkm*	50	46
Permeability coefficient, m^2, $x10^{-13}$	3,24	12
Efficiency parameter E_1	0,09	0,175
Dirt capacity, %	3	12
Absolute fineness of cleaning, *mkm*	7	7
Mean square deviation of local permeability	0,065	0,03
Nominal shear force, *kN*	4,5	4,6

The analysis of the above data shows that the samples of PPM made by the method of vibroforming, in comparison with the samples obtained by sintering by free filling, have an increased set of operational characteristics. So, for example, the permeability coefficient is $12 * 10^{-13}$ m^2, the dirt capacity is *-12* compared to $3{,}24 * 10^{-13}$ m^2 and *3* for PPM obtained by a traditional technological process, The data provided indicate that the vibration molding method allows obtaining PPM with an increased set of operational characteristics.

References

1. Тешабоев, А. Э., Рубидинов, Ш. Ғ. Ў., Назаров, А. Ғ. Ў., & Ғайратов, Ж. Ғ. Ў. (2021). Машинасозликда юза тозалигини назоратини автоматлаш. *Scientific progress*, *1*(5), 328-335.

2. Юсупов, С. М., Ғайратов, Ж. Ғ. Ў., Назаров, А. Ғ. Ў., & Юсуфжонов, О. Ғ. Ў. (2021). Композицион материалларни борлаш. *Scientific progress*, *1*(4), 124-130.

3. Юсуфжонов, О. Ғ., & Ғайратов, Ж. Ғ. (2021). Штамплаш жараёнида ишчи юзаларни ейилишга бардошлилигини оширишда мойлашни аҳамияти. *Scientific progress*, *1*(6), 962-966.

4. Рубидинов, Ш. Ғ. Ў., & Ғайратов, Ж. Ғ. Ў. (2021). Штампларни таъмирлашда замонавий технология хромлаш усулидан фойдаланиш. *Scientific progress*, *2*(5), 469-473.

5. Рубидинов, Ш. Г. У., & Ғайратов, Ж. Г. У. (2021). Кўп операцияли фрезалаб ишлов бериш марказининг тана деталларига ишлов беришдаги унумдорлигини тахлили. *Oriental renaissance: Innovative, educational, natural and social sciences*, *1*(9), 759-765.

6. Рубидинов, Ш. Ғ. У., Ғайратов, Ж. Ғ. У., & Райимжонов, Қ. Р. Ў. (2021). ИЗНОСОСТОЙКИЕ МЕТАЛЛОПОДОБНЫЕ СОЕДИНЕНИЯ. *Scientific progress*, *2*(8), 441-448.

7. Тураев, Т. Т., Топволдиев, А. А., Рубидинов, Ш. F., & Жайратов, Ж. F. (2021). Параметры и характеристики шероховатости поверхности. *Oriental renaissance: Innovative, educational, natural and social sciences*, *1*(11), 124-132.

8. Тешабоев, А. М., Рубидинов, Ш. Ғ. У., & Ғайратов, Ж. Ғ. У. (2022). АНАЛИЗ РЕМОНТА ПОВЕРХНОСТЕЙ ДЕТАЛЕЙ С ГАЗОТЕРМИЧЕСКИМ И ГАЛЬВАНИЧЕСКИМ ПОКРЫТИЕМ. *Scientific progress*, *3*(2), 861-867.

9. Рубидинов, Ш. Ғ. У., Қосимова, З. М., Ғайратов, Ж. Ғ. У., & Акрамов, М. М. Ў. (2022). МАТЕРИАЛЫ ТРИБОТЕХНИЧЕСКОГО НАЗНАЧЕНИЯ ЭРОЗИОННЫЙ ИЗНОС. *Scientific progress*, *3*(1), 480-486.

10. Рубидинов, Ш. Ғ. У., Ғайратов, Ж. Ғ. У., & Ахмедов, У. А. У. (2022). МАТЕРИАЛЫ, СПОСОБНЫЕ УМЕНЬШИТЬ КОЭФФИЦИЕНТ ТРЕНИЯ ДРУГИХ МАТЕРИАЛОВ. *Scientific progress*, *3*(2), 1043-1048.

11. Mamirov, A. R., Rubidinov, S. G., & Gayratov, J. G. (2022). Influence and Effectiveness of Lubricants on Friction on the Surface of Materials. *Central Asian Journal of Theoretical and Applied Science*, *3*(4), 83-89.

12. Mamatov, S. A. (2022). Paint Compositions for the Upper Layers of Paint Coatings. *Middle European Scientific Bulletin*, *23*, 137-142.

13. Шохрух, Г. У. Р., & Гайратов, Ж. Г. У. (2022). Анализ теории разъемов, используемых в процессе подключения радиаторов автомобиля. *Science and Education*, *3*(9), 162-167.

14. Ruzaliyev, X. S. (2022). Analysis of the Methods of Covering the Working Surfaces of the Parts with Vacuum Ion-Plasmas and the Change of Surface Layers. *Eurasian Scientific Herald*, *9*, 27-32.

15. Шохрух, Г. У. Р., Гайратов, Ж. Г. У., & Усмонов, А. И. У. (2022). Анализ применения износостойких покрытий и модифицированных покрытий на рабочих поверхностях деталей. *Science and Education*, *3*(6), 403-408.

16. Шохрух, Г. У. Р., & Гайратов, Ж. Г. У. (2022). Анализ технологической системы обработки рабочих поверхностей деталей вала на токарном станках. *Science and Education*, *3*(8), 23-29.

17. Рубидинов, Ш. Ғ. Ў. (2021). Бикрлиги паст валларга совуқ ишлов бериш усули. *Scientific progress*, *1*(6), 413-417.

18. Nomanjonov, S., Rustamov, M., Rubidinov, S., & Akramov, M. (2019). STAMP DESIGN. *Экономика и социум*, (12), 101-104.

19. Qosimova, Z. M., & RubidinovSh, G. (2021). Influence of The Design of The Rolling Roller on The Quality of The Surface Layer During Plastic Deformation on the Workpiece. *International Journal of Human Computing Studies*, *3*(2), 257-263.

20. Рубидинов, Ш. Ғ. Ў., & Акбаров, К. И. Ў. (2021). Машинасозликда сочилувчан материалларни ташишда транспортер тизимларининг аҳамияти. *Scientific progress*, *2*(2), 182-187.

21. Fayzimatov, S., & Rubidinov, S. (2021). Determination of the bending stiffness of thin-walled shafts by the experimental methodological method due to the formation of internal stresses. *International Engineering Journal For Research & Development*, *6*(2), 5-5.

22. Тешабоев, А. М., & Рубидинов, Ш. Ғ. У. (2022). ВАКУУМНОЕ ИОННО-ПЛАЗМЕННОЕ ПОКРЫТИЕ ДЕТАЛЕЙ И АНАЛИЗ ИЗМЕНЕНИЯ ПОВЕРХНОСТНЫХ СЛОЕВ. *Scientific progress*, *3*(2), 286-292.
23. Teshaboyev, A. M., & Meliboyev, I. A. (2022). Types and Applications of Corrosion-Resistant Metals. *Central Asian Journal of Theoretical and Applied Science*, *3*(5), 15-22.
24. Рубидинов, Ш. Ғ. У., & Раимжонов, Қ. Р. Ў. (2022). Изменение микрорельефа поверхности и шероховатости допусков деталей после химичке-термический обработки борирования. *Scientific progress*, *3*(1), 34-40.
25. Akramov, M., Rubidinov, S., & Dumanov, R. (2021). METALL YUZASINI KOROZIYABARDOSH QOPLAMALAR BILAN QOPLASHDA KIMYOVIY-TERMIK ISHLOV BERISH AHAMIYATI. *Oriental renaissance: Innovative, educational, natural and social sciences*, *1*(10), 494-501.
26. Рубидинов, Ш. Ғ. Ў., Муродов, Р. Т. Ў., & Хакимжонов, Х. Т. Ў. (2022). ХАРАКТЕРИСТИКИ ИЗНОСОСТОЙКИХ ПОКРЫТИЙ И МОДИФИЦИРОВАННЫХ ПОКРЫТИЙ. *Scientific progress*, *3*(3), 371-376.
27. O'G'Li, S. G. A., & O'G'Li, J. G. A. (2022). Ishlab chiqarish va sanoatda kompozitsion materiallarning o'rni. *Science and Education*, *3*(11), 563-570.
28. Shoxrux G'ayratjon o'g, R., Oybek o'g'li, O., & Bahodirjon o'g'li, L. A. (2022). Effect of Using Rolling Material in the Manufacture of Machine Parts. *Central Asian Journal of Theoretical and Applied Science*, *3*(12), 137-145.
29. Shoxrux G'ayratjon o'g, R. (2022). Features Of Machining Machine Parts On Cnc Machines Productivity And Accuracy. *Eurasian Scientific Herald*, *12*, 70-76.
30. Shoxrux G'ayratjon o'g, R. (2022). Classification of Wear of Materials Under Conditions of High Pressures and Shock Loads. *Eurasian Scientific Herald*, *9*, 21-26.
31. Shoxrux G'ayratjon o'g, R., Qurbonali o'g'li, A. Q., & Dilshodjon o'g'li, T. I. (2022). Reconstruction of Machined Surfaces by Contact Welding and Milling of Worn Parts. *Eurasian Scientific Herald*, *9*, 8-14.
32. Таджибаев, Р. К., Гайназаров, А. А., & Турсунов, Ш. Т. (2021). Причины Образования Мелких (Точечных) Оптических Искажений На Ветровых Стеклах И Метод Их Устранения. *Central Asian Journal of Theoretical and Applied Science*, *2*(11), 168-177.
33. Tadjibaev, R. K., & Tursunov, S. T. (2022). Scientific Research and Study Behavior of Curved Pipes Under Loads. *Central Asian Journal of Theoretical and Applied Science*, *3*(3), 81-86.
34. Tursunov, S. T., & Sayfiev, B. X. (2022). Protection Against Counterfeit Products-An Important Guarantee of Your Safety. *Eurasian Scientific Herald*, *8*, 181-187.
35. Таджибаев, Р. К., Турсунов, Ш. Т., & Гайназаров, А. А. (2022). Повышения качества трафаретных форм применением косвенного способа изготовления. *Science and Education*, *3*(11), 532-539.
36. Гайназаров, А. Т., & Абдурахмонов, С. М. (2021). Системы обработки результатов научных экспериментов. *Scientific progress*, *2*(6), 134-141.
37. Акрамов, М. М. (2022). Краткая Характеристика Горячих Цинковых Покрытий. *Central Asian Journal of Theoretical and Applied Science*, *3*(5), 232-237.
38. Акрамов, М. М. (2021). ДЕТАЛЛАРНИНГ ЮЗАЛАРИНИ КИМЁВИЙ-ТЕРМИК ИШЛОВ БЕРИШГА ҚАРАТИЛГАН ТАКЛИФЛАР. *Scientific progress*, *2*(6), 123-128.
39. Akramov, M. M. (2021). Metallarni korroziyalanishi va ularni oldini olish samarodorligi. *Scientific progress*, *2*(2), 670-675.

40. Акрамов, М. М. (2021). Повышение физико-механических свойств стальных деталей при пластической деформационной обработке. *Scientific progress*, *2*(6), 129-133.

41. Косимова, З. М. (2022). Анализ Измерительной Системы Через Количественное Выражение Ее Характеристик. *Central Asian Journal of Theoretical and Applied Science*, *3*(5), 76-84.

42. Косимова, З. М., & Акрамов, М. М. Ў. (2021). Технологические особенности изготовления поршней. *Scientific progress*, *2*(6), 1233-1240.

43. Рустамов, М. А. (2021). Методы термической обработки для повышения прочности зубчатых колес. *Scientific progress*, *2*(6), 721-728.

44. Akbaraliyevich, R. M. (2022). Improving the Accuracy and Efficiency of the Production of Gears using Gas Vacuum Cementation with Gas Quenching under Pressure. *Central Asian Journal of Theoretical and Applied Science*, *3*(5), 85-99.

45. Улугхожаев, Р. С. (2022). Методы контроля точности при резания металлов. *Science and Education*, *3*(11), 591-598.

46. Улуғхожаев, Р. С. (2021). Ишлов берилаётган деталнинг аниқлигини ошириш учун метал қирқиш дастгохларини бошқаришда виброакустик сигналлардан фойдаланиш. *Scientific progress*, *2*(6), 1241-1247.

47. Улуғхожаев, Р. С. (2021). КЕСИШ ЗОНАСИДА ҲОСИЛ БЎЛУВЧИ ВИБРОАКУСТИК СИГНАЛЛАРДАН ДЕТАЛНИНГ АНИҚЛИГИНИ НАЗОРАТ ҚИЛИШДА ФОЙДАЛАНИШ. *Oriental renaissance: Innovative, educational, natural and social sciences*, *1*(11), 114-123.

48. Makhamasadikovich, S. S. (2022). Classification of Design Errors in Mechanical Engineering. *Eurasian Scientific Herald*, *9*, 103-108.

49. Makhamasadikovich, S. S. (2022). Control of Design Documentation. *Eurasian Scientific Herald*, *9*, 109-114.

50. Sadirov, S. M. (2022). Modern measuring methods and equipments. *Science and Education*, *3*(11), 495-501.