Austrian Journal of Technical and Natural Sciences

№ 3–4 2022
March– April

PREMIER
Publishing

Vienna
2022

Austrian Journal of Technical and Natural Sciences

Scientific journal

№ 3 – 4 2022 (March– April)

ISSN 2310-5607

Editor-in-chief Hong Han, China, Doctor of Engineering Sciences

International editorial board

Andronov Vladimir Anatolyevitch, Ukraine, Doctor of Engineering Sciences
Bestugin Alexander Roaldovich, Russia, Doctor of Engineering Sciences
S.R.Boselin Prabhu, India, Doctor of Engineering Sciences
Frolova Tatiana Vladimirovna, Ukraine, Doctor of Medicine
Inoyatova Flora Ilyasovna, Uzbekistan, Doctor of Medicine
Kambur Maria Dmitrievna, Ukraine, Doctor of Veterinary Medicine
Kurdzeka Aliaksandr, Russia, Doctor of Veterinary Medicine
Khentov Viktor Yakovlevich, Russia, Doctor of Chemistry
Kushaliyev Kaisar Zhalitovich, Kazakhstan, Doctor of Veterinary Medicine
Mambetullaeva Svetlana Mirzamuratovna, Uzbekistan, Doctor of Biological Sciences
Manasaryan Grigoriy Genrihovich, Armenia, Doctor of Engineering Sciences
Martirosyan Vilena Akopovna, Armenia, Doctor of Engineering Sciences
Miryuk Olga Alexandrovna, Kazakhstan, Doctor of Engineering Sciences
Nagiyev Polad Yusif, Azerbaijan, Ph.D. of Agricultural Sciences
Nemikin Alexey Andreevich, Russia, Ph.D. of Agricultural Sciences
Nenko Nataliya Ivanovna, Russia, Doctor of Agricultural Sciences
Ogirko Igor Vasilievich, Ukraine, Doctor of Engineering Sciences
Platov Sergey Iosifovich, Russia, Doctor of Engineering Sciences
Rayiha Amenzade, Azerbaijan, Doctor of architecture
Shakhova Irina Aleksandrovna, Uzbekistan, Doctor of Medicine
Skopin Pavel Igorevich, Russia, Doctor of Medicine
Suleymanov Suleyman Fayzullaevich, Uzbekistan, Ph.D. of Medicine
Tegza Alexandra Alexeevna, Kazakhstan, Doctor of Veterinary Medicine
Zamazy Andrey Anatolievich, Ukraine, Doctor of Veterinary Medicine
Zhanadilov Shaizinda, Uzbekistan, Doctor of Medicine

Proofreading Kristin Theissen

Cover design Andreas Vogel

Additional design Stephan Friedman

Editorial office Premier Publishing s.r.o.
Praha 8 – Karlín, Lyčkovo nám. 508/7, PSČ 18600

E-mail: pub@ppublishing.org

Homepage: ppublishing.org

Austrian Journal of Technical and Natural Sciences is an international, German/English/Russian language, peer-reviewed journal. It is published bi-monthly with circulation of 1000 copies.

The decisive criterion for accepting a manuscript for publication is scientific quality. All research articles published in this journal have undergone a rigorous peer review. Based on initial screening by the editors, each paper is anonymized and reviewed by at least two anonymous referees. Recommending the articles for publishing, the reviewers confirm that in their opinion the submitted article contains important or new scientific results.

Premier Publishing s.r.o. is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Instructions for authors

Full instructions for manuscript preparation and submission can be found through the Premier Publishing s.r.o. home page at:
http://ppublishing.org.

Material disclaimer

The opinions expressed in the conference proceedings do not necessarily reflect those of the Premier Publishing s.r.o., the editor, the editorial board, or the organization to which the authors are affiliated.

Premier Publishing s.r.o. is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Included to the open access repositories:

© Premier Publishing s.r.o.

All rights reserved; no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Publisher.

Typeset in Berling by Ziegler Buchdruckerei, Linz, Austria.
Printed by Premier Publishing s.r.o., Vienna, Austria on acid-free paper.

Section 1. Mathematics

https://doi.org/10.29013/AJT-22-3.4-3-10

Javadov Khaladdin,
Engineer of oil and gas industry
Baku, Azerbaijan

DISTRIBUTION OF PRIME NUMBERS. INVOLUTE NATURE OF PRIME NUMBERS. RIEMANN HYPOTHESIS

Abstract

This manuscript is related to Prime numbers distribution, and I am not going to give an additional information about Riemann Hypothesis and history behind of it. I will try to keep simple.

And yet, her main idea is that there is a certain pattern in the distribution of simple (i.e., divisible only by 1 and by itself) numbers among natural (i.e. integers in general). This allows us to represent any natural number in the form of a product of several factors, regardless of the value of this number. In practice, this is used, for example, in computer data encryption, when the selection of factors that make up some large natural number takes such a huge amount of time that it becomes, in fact, impossible to solve the cipher.

Keywords: prime numbers, Riemann Hypothesis, pattern in the distribution of simple, computer data encryption

Riemann Hypothesis from Wikipedia.

We all know what the Prime Numbers are:

2, 3, 5, 7, 11, 13, 17, 19 … …and so

I have just put the Prime numbers on the parallel line with Natural Numbers, and we know what the Natural numbers are:

1, 2, 3, 4, 5, 6, 7, 8, 9… and so and we can compare the natural and prime numbers.

Table 1.

1	2	0.5	2
2	3	0.666667	1.5
3	5	0.6	1.666667
4	7	0.571429	1.75
5	11	0.454545	2.2
6	13	0.461538	2.166667
7	17	0.411765	2.428571
8	19	0.421053	2.375
9	23	0.391304	2.555556
10	29	0.344828	2.9
11	31	0.354839	2.818182
12	37	0.324324	3.083333
13	41	0.317073	3.153846
14	43	0.325581	3.071429
15	47	0.319149	3.133333
16	53	0.301887	3.3125
17	59	0.288136	3.470588
18	61	0.295082	3.388889
19	67	0.283582	3.526316
20	71	0.28169	3.55
21	73	0.287671	3.47619

https://doi.org/10.29013/AJT-22-3.4-52-58

Radkevich Maria Viktorovna,
D. Sc. in Engineering, Professor,
National Research University
"Tashkent Institute of Irrigation and
Agricultural Mechanization Engineers",
Republic of Uzbekistan, Tashkent

Shipilova Kamila Bakhtiyarova,
PhD, Senior Lecturer,
National Research University
"Tashkent Institute of Irrigation and
Agricultural Mechanization Engineers",
Republic of Uzbekistan, Tashkent

Abdukodyrova Malokhat Noridzhonovna,
Associate professor,
National Research University
"Tashkent Institute of Irrigation and
Agricultural Mechanization Engineers",
Republic of Uzbekistan, Tashkent,

A REVIEW OF METHODS FOR ASSESSING THE EVAPORATION OF LIQUID DROPS UNDER VARIOUS CONDITIONS

Abstract. The article discusses methods for estimating the evaporation of liquid droplets under various environmental conditions. All estimation methods can be divided into three groups: evaporation of a stationary levitating drop, evaporation of a falling drop, and evaporation of a drop lying on a solid surface. The possibility of using the considered models and data in the design of local climate control systems is assessed.

Keywords: evaporation, drop, water vapor, surface, airflow.

Introduction. The problem of evaporation of liquid droplets is constantly studied by scientists all over the world due to a variety of practical tasks. Knowledge of evaporation processes of single droplets under various environmental conditions allows to design and improve technical cooling systems, microclimate installations, various energy and heating systems [3, 4, 26].

The purpose of this article is to review existing models for evaluating liquid droplet evaporation for further application in designing a local climate control system.

The first drop evaporation model was proposed by Maxwell in 1887 [4]. This model was very simple and was constructed under the assumption that the evaporation process is limited to vapor diffusion. Expression for calculation of vapor flux from the drop surface was obtained by integration of vapor flux equation from liquid surface and has the form:

$$j_w = 4\pi r_0 D_v \left(\rho_{vs} - \rho_{v0}\right) \quad (1)$$

where j_W is flux of number of vapor molecules from drop surface, r_0 is drop radius, D_V, ρ_{VS} and ρ_{V0} are vapor diffusion coefficient and its density on surface and in ambient gas.

This model is suitable only for stationary conditions, which are practically never met in reality, as the drop size inevitably changes during evaporation.

Based on the same assumptions as the Maxwell model, the Spalding model was built, which takes into account the change in droplet diameter over time. This model was called "law d²" and found wide application in practical calculations [4]:

$$\left(\frac{d}{d_0}\right)^2 = 1 - \frac{8D_V\rho_0}{d_0^2\rho_{ж}} ln\left(1 + b_{1d}\right)t \qquad (2)$$

However, Maxwell and Spalding models describe only the functional dependence of drop size change with time and are applicable only to diffuse evaporation.

Hertz and Knudsen models are developed to describe the kinetic or free-molecular mode of evaporation [4].

$$I = \frac{1}{4}\pi r^2{}_p \frac{M}{RT}\sqrt{\frac{8RT}{\pi M}}\alpha_m\left(p_S - p_\infty\right) \qquad (3)$$

where α_m is the fraction of the number of falling vapor molecules condensing into the liquid phase, M is the molar mass of vapor, R is the universal gas constant

Given classical models can not solve all variety of practical problems of drop evaporation. Therefore, for each newly emerging problem researchers look for a suitable solution, as a rule, by experiment. Let's consider different approaches to estimation of evaporation of droplets.

Evaporation of a stationary droplet in an air stream.

The simplest case of evaporation of droplets immobile in relation to medium, which excludes influence of hydrodynamic factor, was considered by N.A. Fuchs [25]. He found that for sufficiently small droplets their motion is not reflected in the evaporation rate, i.e. the evaporation process is quasi-stationary.

In some works, evaporation of a stationary droplet in an air stream was studied for different droplet diameters at high temperatures of air or superheated steam [5; 15; 17, 22–24, 27; 29].

For example, it is noted in [29] that in most real cases evaporation of a droplet is significantly affected by conductive component of heat flow spent on heating or cooling to adiabatic evaporation temperature.

Studies of evaporation of a stationary droplet in an air stream were conducted by N.E. Shishkin, V.V. Terekhov, M.A. Pakhomov et al. [22–24].

In [22] evaporation processes of droplets in streams of different types were compared. It was found that during evaporation of a droplet in a vapor-gas flow, heat transfer is more intense compared to single-component vapor-droplet flow and single-phase vapor flow.

When studying droplets with diameter not more than 3 mm of pure liquids of water, ethanol and acetone suspended motionless in an aerodynamic channel in an air flow directed from below upwards, it was noted that the surface temperature of the droplets was non-uniform. Evaporation of droplets in a stationary medium (at an air temperature of 19.8 °C) was of a similar nature. It was found that for all pure liquids at the initial moments of time the droplet surface temperature was close to the adiabatic evaporation temperature [27]. In further studies [23], evaporation of a suspended droplet in a stream of hot (300 °C) air was investigated when the flow rate changed from 0 to 6 m/s. It was found that for water droplets the ratio $\frac{j_w}{p_0 V_0}$ (ratio of flow of evaporating liquid to initial mass) remains unchanged for a long time.

This data is of some interest for the design of microclimate systems, but in real conditions the droplet cannot remain stationary and the airflow will not be strictly vertical.

Evaporation of a falling droplet in an air stream.

Research on evaporation of the falling drop of liquid is of practical interest. Such researches were

carried out by Spiglazova A. S., Mezentsev A. V., Antonov A. S., Zhailaubaev J. D. et al. [1; 14; 16; 17; 21].

As a result of experimental studies in [17] for the movement of water droplets in a stream of hot gases (temperature above 1000 K), were established integral characteristics of the evaporation of droplets and droplet evaporation constants for the known models of heat and mass transfer. The obtained values can be used in practical calculations and numerical simulation of evaporation processes for the conditions of high-temperature cleaning of liquids, polydisperse fire extinguishing, etc.

In the work of Zhailaubaev Zh. [14] gives the basis for calculating the surface temperature of evaporating droplets for the entire period of nonstationary evaporation (when a vortex heat flow occurs), in which two stages are highlighted:

1 – propagation of thermal and concentration perturbations from the contact surface to the depth of the phases (the duration of the first stage of evaporation is equal to the contact time of the surface element with the gas phase and does not exceed 10^{-3}–10^{-4} s for atomized liquid droplets);

2 – stage of nonstationary evaporation, during which the resistance created by the gas phase to exchange processes remains constant. Temperature of liquid in the second stage approaches the value of adiabatic evaporation temperature, achievement of which is considered as the beginning of stationary evaporation of droplets.

Experiments carried out by the authors with suspended droplets 0.56 to 2.5 mm in diameter at air velocities up to 6.5 m/s allowed to obtain solution of the thermal conductivity equation from which the expression for calculation of evaporation rate was derived:

$$q = A(T_1)\cdot r + \varepsilon_K \cdot B\,(T_1)\cdot r^2 \qquad (4)$$

T – temperature; ε_K – thermal conductivity coefficient; r – current radius (coordinates); A, B – constants.

Despite the apparent simplicity of the considered model, its practical use requires a number of experiments to determine the calculated values of constants A and B.

In the work of Spiglazova A. S. [21] studied the influence of air resistance on evaporation of a falling drop. Analytical expressions were obtained for different ratios of evaporation rate and proportionality factor for the drag force. The use of these models in real conditions is difficult because of the difficulty of accurately assessing the conditions of resistance of the medium to the movement of the droplet.

The kinetics of evaporation of water droplets free-flying in an air stream was analyzed in [13] in order to formulate requirements for the optimal droplet size in an air-droplet mixture designed for cooling production equipment. The following features arise when droplets are forcibly injected into the air stream:

– the droplet expends its mass during evaporation until it disappears;

– small droplets that are in suspension are noticeably affected by viscous frictional forces and therefore their relative velocity in the air is low;

– a stable boundary layer of laminar type is formed around a droplet, which practically excludes the influence of convection and turbulence, so the diffusion of steam from the droplet surface into the ambient air occurs mainly at the molecular level.

Once in the air flow, the droplet very quickly reaches the psychrometric temperature, and further evaporation proceeds mainly at a steady temperature. It was found that the duration of existence of water droplets injected into the air stream is inversely proportional to their initial radius. For example, time of evaporation of a drop with initial radius $r_0 = 0.01$ mm in the flow is $\tau \cong 0.5\ s$.

Some authors [2, 20] investigated possibilities of influencing droplet evaporation processes by means of electric fields. In [2] influence of electric field on intensity of evaporation of levitating drops of liquid was simulated and empirical expression for calculation of time of complete evaporation for drops with size d = 4–5 mm was obtained:

$$t = 1.64f - 40.9, \quad (5)$$

where f is the relative humidity of the air.

It has been experimentally established that constant electric field of 3 kV/cm maximally intensifies processes of evaporation of water drop suspended in air flow.

Model (5) is notable for its simplicity and ease of use in practical calculations, however, this model is not suitable for calculations of microclimate systems as it was developed for evaporation of large drops only.

Comparison of evaporation processes of superheated and cold water was carried out by D. V. Marinichev [19], who found that fine atomization of superheated water with predominance of microdroplets with a diameter less than 3 microns can be achieved by using the technology of explosive boiling of strongly superheated liquid. It was proved that when superheated water is sprayed into an air stream at a velocity of up to 40 m/s, the droplet size distribution has a pronounced bimodal character. Atomizing water temperature of 220–240 °C about 65–70 mass percent of the droplets have diameter less than 3 microns, and the average diameter of large droplets is about 8 microns which is about 1.5–2.5 times less than atomizing cold water. When spraying with cold water (up to 150 °C) droplet size distribution remains unimodal. Data on the droplet size and nature of droplet distribution can be very useful in the calculation of microclimate systems.

Evaporation of droplets from a solid surface.

The process of evaporation of liquid droplets from various surfaces has been studied by many authors [16; 18; 20; 28; 30]. For the purposes of designing microclimate systems, processes of evaporation from surfaces are significant from the point of view that when spraying coolants into the air, a significant proportion of droplets inevitably settles on various surfaces and there continue to evaporate. Therefore further we shall consider results of researches of evaporation of liquid from surfaces of soil, leaves and various solid materials.

Many authors considering evaporation of water droplets from solid surfaces point out that:

– The evaporation rate increases with increasing surface temperature and is highly dependent on the roughness of the wall [30];

– evaporation of droplets smaller than 500 μm directly depends on the thermal conductivity of the substrate [28];

– changes in the electrokinetic potential of particles affect the evaporation of droplets [20]: an increase in the electrokinetic potential of particles leads to a change in the evaporation scenarios of a droplet located on a solid surface: the adhesion of the droplet to the underlying surface weakens, the droplet begins to move with a change in the surface shape, which leads to either acceleration or slowdown of evaporation.

A wide range of studies of evaporation from soil surface was carried out at Research Institute of Hydrometeorology (Uzbekistan) [6–11]. To estimate these processes, theoretical analysis of soil moisture evaporation process was made [11] based on equations of particle number balance and speed of their motion, mathematical dependencies between characteristic particle size of its area and volume were obtained [8]. In [9; 10], based on the generalized equilibrium equation and material balance of particles as well as the equations of hydrodynamics for a continuous medium and energy for air, a multiphase model of interaction between different kinds of underlying surface and air flows in the surface layer and upper atmosphere is analyzed. For these conditions the amount of vapor evaporating from a particle per unit time is calculated.

The problem of estimating the time of evaporation of raindrops and dewdrops from the surface of plant leaves was considered in [12]. To create microclimate systems in arid areas, it is important to be able to manage the time of evaporation of water from plant leaf surfaces. Thomson formula is used to estimate the dependence of saturated vapor pressure over a small droplet:

$$P = P_{\infty} e \frac{2M\sigma V_M}{aRT} \quad (6)$$

where M is the molecular mass, a is the changing drop radius, T is the thermodynamic temperature, V_M is the molar volume, σ is the surface tension of the liquid formed by vapor condensation.

From the above expression it can be concluded that the saturated vapor pressure over the convex surface of the droplets will be greater than over the flat one. Based on this statement the author [12] analyzed the evaporation time of a spherical droplet of small size lying on the surface of a solid body (sheet) at relative humidity f at temperature T:

$$t = \frac{RT\rho_{liq}^2 a_0^3 \left(2 - 3cos\theta + cos^3\theta\right)}{24DM\sigma\rho_{sat} f} \qquad (7)$$

θ – contact angle, ρ_{sat} – saturated vapor density, D – diffusion coefficient, r – drop radius, a_0 – initial radius.

An example of calculation of time of evaporation of a water droplet with initial radius a_0 = 0.1 mm evaporating from solid surface at contact angle θ = 120 degrees and temperature T = 293 K resulted in t = 325 hours. This result raises certain doubts about the adequacy of the proposed model. The approach suggested by the author is of interest, however, the model obtained obviously requires refinement.

Conclusion. Many of the considered computational schemes are in principle not stable in practical calculations, or give calculation results which are inadequate to the physical rules of substance movement in a gas flow.

Nevertheless, the data and models obtained by Balakrova S. B., Dokhov M. P., Shishkin N. E., Marinichev D. V. may be recommended (after clarification in real conditions) for calculation and design of microclimate systems based on atomization in the air of water droplets.

References:

1. Антонов А. С. Сравнительный анализ моделей испарения капли жидкости в потоке газа.– Электронный ресурс. Режим доступа: URL: https://pandia.ru/text/80/589/10200.php. Дата обращения: 12.06.2022.
2. Балкарова С. Б. Экспериментальное исследование процессов тепломассообмена капель воды, кристаллизующихся в потоке воздуха. Автореф. дисс. …к.ф.-м.н. – Нальчик: Кабардино-Балкарский Государственный университет.– 17 с.
3. Береснев С. А., Грязин В. И. Физика атмосферных аэрозолей: Курс лекций.– Екатеринбург: Изд-во Урал. ун-та, 2008.– 227 с
4. Васильев П. С. Теплообмен при капельном кипении жидкостив технологических аппаратах. Диссертация на соискание учёной степени кандидата технических наук. – Волгоград, 2018.
5. Войтков И. С., Волков Р. С., Кузнецов Г. В., Стрижак П. А. Высокотемпературное испарение капель воды в газовой среде. Журнал технической физики,– Том 87.– Вып. 12. 2017.
6. Денисов Ю. М. Математическая модель переноса влаги. Метеорология и гидрология – № 3. 1978.– С. 67–93.
7. Денисов Ю. М. Некоторые эвристические соотношения по оценки потоков импульса, тепла и пара // Труды Среднеазиатского научно-исследовательского гидрометеорологического института.– Выпуск 160 (238).– Ташкент, 1999.
8. Денисов Ю. М. Основы теории образования и движения аэрозолей // Труды Среднеазиатского научно-исследовательского гидрометеорологического института. Оценка загрязнения природной среды Среднеазиатского региона.– Выпуск 155(236).– Ташкент, 1998.
9. Денисов Ю. М., Джураев А. А. Математическая модель некоторых микрофизических процессов в облаке. Математическое моделирование гидрологических процессов. Средне-Азиатский региональный научно-исследовательский гидрометеорологический институт – Выпуск 63(144). 1979.

10. Денисов Ю. М., Овчаренко В. П. Многофазная магнитодинамическая модель атмосферы. Труды. Вопросы гидродинамики атмосферы. Средне-Азиатский региональный научно-исследовательский гидрометеорологический институт – Выпуск 21(102).– Ленинград, 1975 г.
11. Денисов Ю. М., Сергеев А. И., Безбородов Г. А., Безбородов Ю. Г. Испарение почвенной влаги с оголенных почвогрунтов // Труды Среднеазиатского научно-исследовательского гидрометеорологического института. Математическое моделирование процессов стока горных рек.– Выпуск 163(244).– Ташкент, 2001.
12. Дохов М. П. Влияние кривизны на испарение малых капель жидкостей // Фундаментальные исследования,– № 5. 2006.– С. 83–84.
13. Емельянов А. Л., Платунов Е. С. Кинетика испарения капель в системах охлаждения теплонагруженных элементов приборов// Изв. Вузов. Приборостроение.– Т. 54.– № 1. 2011.– С. 84–88.
14. Жайлаубаев Ж. Д. Нестационарное испарение капель при фазовом переходе. Вестник ПГУ – № 2. 2010.
15. Жорнова О. Н., Гальперин Л. Г. Расчет скорости испарения капель воды в потоке перегретого водяного пара.– Электронный ресурс. URL: https://elar.urfu.ru/bitstream/10995/57869/1/eir_2017_035.pdf/ Дата обращения: 24.05.2022.
16. Кащеев В. М., Муранов Ю. В., Юрьев Ю. С. Определение потока испарения при дисперсно-кольцевом и дисперсном режимах течения (по результатам численного эксперимента). Физико-энергетический институт – 1330. 1982.– 18с.
17. Кузнецов Г. В., Куйбин П. А., Стрижак П. А. Оценка численных значений констант испарения капель воды, движущихся в потоке высокотемпературных газов, ТВТ, – том 53. – выпуск 2. 2015.– С. 264–269.
18. Кузнецов Г. В., Феоктистов Д. В., Орлова Е. Г. Испарение капель жидкостей с поверхности анодированного алюминия Теплофизика и аэромеханика,– Том 23.– № 1. 2016.
19. Мариничев Д. В. Экспериментальное исследование тонкодисперсного распыла перегретой воды. Дисс… кандидата техн. наук. – Москва: Объед. ин-т высок. температур РАН, 2013.– 116 с.
20. Молчанов С. П., Чернова-Хараева И.А., Сенчихин И. Н. Влияние электрокинетического потенциала на испарение капель коллоидных дисперсий. коллоидный журнал,– Том 81.– № 2. 2019.– С. 202–211.
21. Спиглазова А. С., Мезенцев А. В. Движение равномерно испаряющейся капли жидкости с учетом действия силы тяжести и двух различных сил сопротивления – Электронный ресурс. URL: https://elar.urfu.ru/bitstream/10995/94067/1/978–5–91256–506–9_2020_018.pdf/ Дата обращения: 5.06.2022.
22. Терехов В. И., Пахомов М. А., Чичиндаев А. В. Влияние испарения жидких капель на распределение параметров в двухкомпонентном ламинарном потоке. Прикладная механика и техническая физика.– Т. 41.– № 6. 2000.
23. Терехов В. И., Терехов В. В., Шишкин Н. Е. Экспериментальное и численное исследование нестационарного испарения капель жидкости // I Minsk International Heat and Mass Transfer Forum, MIF 2008. – Minsk, May 19–23. 2008.
24. Терехов В. И., Шишкин Н. Е. Испарение капель водных смесей легко – и высококипящих жидкостей в воздушном потоке. Сборник научных статей Современная наука. 2010.
25. Фукс Н. А. Испарение и рост капель в газообразной среде. Издательство Академии наук СССР.– Москва. 1958.

26. Шиляев М. И., Хромова Е. М., Григорьев А. В., Тумашова А. В. Физико-математическая модель конденсационного процесса улавливания субмикронной пыли в форсуночном скруббере. Теплофизика и аэромеханика,– Том 18. № 3. 2011.
27. Шишкин Н. Е. Аэродинамика и тепломассообмен в пристенных закрученных одно- и двухфазных струях. Дисс. … доктора техн. наук. Новосибирск: Институт теплофизики им. С. С. Кутателадзе, 2016.– 266 с.
28. Bazargan V. Effect of substrate cooling and droplet shape and composition on the droplet evaporation and the deposition of particles. Thesis. The University of British Columbia. March, 2014.
29. Guang Jin, Rui Tian, Xingwang Song, Wenfei Wu. Theoretical and Experimental Studies of Droplet Evaporation in High-Temperature Air. The Second China Energy Scientist Forum. 2010.
30. Misyura S. Y., Morozov V. S. Droplet Evaporation on a Heated Structured Wall. Thermal Science: Year – Vol. 23.– No. 2A. 2019.– P. 673–681.

Contents

Section 1. Mathematics **3**

Javadov Khaladdin
DISTRIBUTION OF PRIME NUMBERS. INVOLUTE NATURE OF PRIME NUMBERS. RIEMANN HYPOTHESIS 3

Section 2. Medical science **11**

Shermatova G. D., Eshbakova K. A., Narbutaeva D. A., Karakulova A. M.
ANTIOXIDANT AND ANTIHYPOXIC ACTIVITY OF EMODIN AND CHRYSOPHANOL 11

Section 3. Mechanics **14**

Kalmova Maria
THE SCOPE OF APPLICATION OF DEVICES WHOSE OPERATION IS BASED ON TAKING INTO ACCOUNT THE CONNECTIVITY OF THERMOELECTROELASTIC FIELDS 14

Section 4. Food processing industry **17**

Rakhmonov Kakhramon Sanokulovich, Khudaikulov Anvar Shavkatovich, Atamuratova Tamara Ivanovna
TECHNOLOGICAL ASPECTS OF THE PRODUCTION OF WHEAT BREAD VARIETIES USING SPONTANEOUS FERMENTATION STARTERS 17

Yulchiev Aslbek, Serkayev Qamar, Mirzaev Abdugappor, Asqarov Ibrokhim
TECHNOLOGICAL SCHEME OF REFINING OF COTTONSEED OIL PURIFIED FROM GOSSYPOL 23

Section 5. Technical sciences **30**

Akhmedov Ulug Karimovich, Kurambaev Sherzod Raimberganovich, Bakhtiyarov Sardorbek Bakhtiyarovich
OBTAINING COTTONSEED OIL THAT MEETS THE REQUIREMENTS OF FOOD SAFETY OF THE POPULATION 30

Soliev L., Jumaev M. T., Nizomov I. M., Makhmadov Kh.R., Olimdzonova N. V., Muzafarova D. V.
FORMATION OF INVARIANTE QUILIBRIA IN MULTICOMPONENT SYSTEMS AND DETERMINATION OF SOLID PHASE CRYSTALLIZATION PATHWAY 35

Nurov Kurbonali Bozorovich, Dzhuraev Tukhtasun Dzhuraevich, Jafarov Amirsho Sayobidovich
INVESTIGATION OF THE REGION OF EXAMINATION OF MELTS IN SYSTEMS In – B^{VI} (B^{VI} – S, Se, Te) BY THE ACOUSTIC METHOD 44

Radkevich Maria Viktorovna, Shipilova Kamila Bakhtiyarova, Abdukodyrova Malokhat Noridzhonovna
A REVIEW OF METHODS FOR ASSESSING THE EVAPORATION OF LIQUID DROPS UNDER VARIOUS CONDITIONS 52

Section 6. Chemistry **59**

Ergashev Dilmurod Adiljonovich, Khamdamova Shokhida Sherzodovna, Mirzaolimov Akmal Nabiyevich, Eshpulatova Matluba Boymuradovna
THE SOLUBILITY OF COMPONENTS IN THE SYSTEM $\{99.7[30\,MgSO_4+70\%\,H_2O]+0.3\%HNO_3\cdot NH_2C_2H_4OH-(NH_4)_6Mo_7O_{24}\cdot 4H_2O$ 59

Butaev Khurshid, Ikramov Abduvakhob, Kadirov Khasan, Baltabaev Ulugbek Narbaevich
COMPARATIVE CHARACTERISTICS OF OCTANE-ENHANCING ADDITIVES BASED ON O- AND N-CONTAINING RAW MATERIALS 67

Geldiev Y. A., Turaev Kh. Kh., Umbarov I. A.
THERMAL ANALYSIS OF MODIFIED POLYSILICIC ACID WITH AMINO ALCOHOLS 72

Khamdamova Dilnoza, Umarova Vasila, Primkulov Mahmud
OBTAINING CELLULOSE FROM THE MEDICINAL PLANT MILK THISTLE 76

Kaypnazarov Turdibay Nzamatdinovich, Uteniyazov Karimbay Kuanishbaevich,
Mirzaeva Makhira Risbaevna, Abdullayev Nasir Dzhalilovich, Ramazonov Nurmurod Sheralievich
TRITERPENE GLYCOSIDES TRAGACANTHA STIPULOSA AND THEIR GENINS.
STRUCTURE OF CYCLOSTIPULOSIDE D 82

Toshpulatov D. T., Mirzaev Sh.E., Nasimov A. M., Yakubov B. A., Samiev A. A., Tashpulatov Kh. Sh.
SYNTHESIS OF $[CO(BPY)(SCN)_4]^{2+}$ COMPLEX AND ITS PHOTOCHEMICAL
PROPERTIES IN THE SOL-GEL MATRIX 87

Fayzullayev Normurot I., Kholmirzayeva Khilola N.
DEVELOPMENT OF TECHNOLOGY FOR MAKING NANO SORBENT FROM WOOD
PROCESSING WASTE..... 92

Kholikulov B. N., Makhsumov A. G., Umrzokov A. T., Ziyadullayev A.E.
SYNTHESES AND TECHNOLOGY OF 2-BROMO-SUBSTITUTED BIS-CARBAMATE
DERIVATIVES, PROPERTIES AND THEIR APPLICATION..... 100