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Bischofite

The experience of using the mineral in Russian medicine

Bischofite

- Hydrous magnesium chloride mineral
- $MgCl_2 \cdot 6H_2O$
- Colourless to white
- Bitter-salty taste
- Highly soluble in water

Chemical composition of bischofite from the Lower Volga Basin

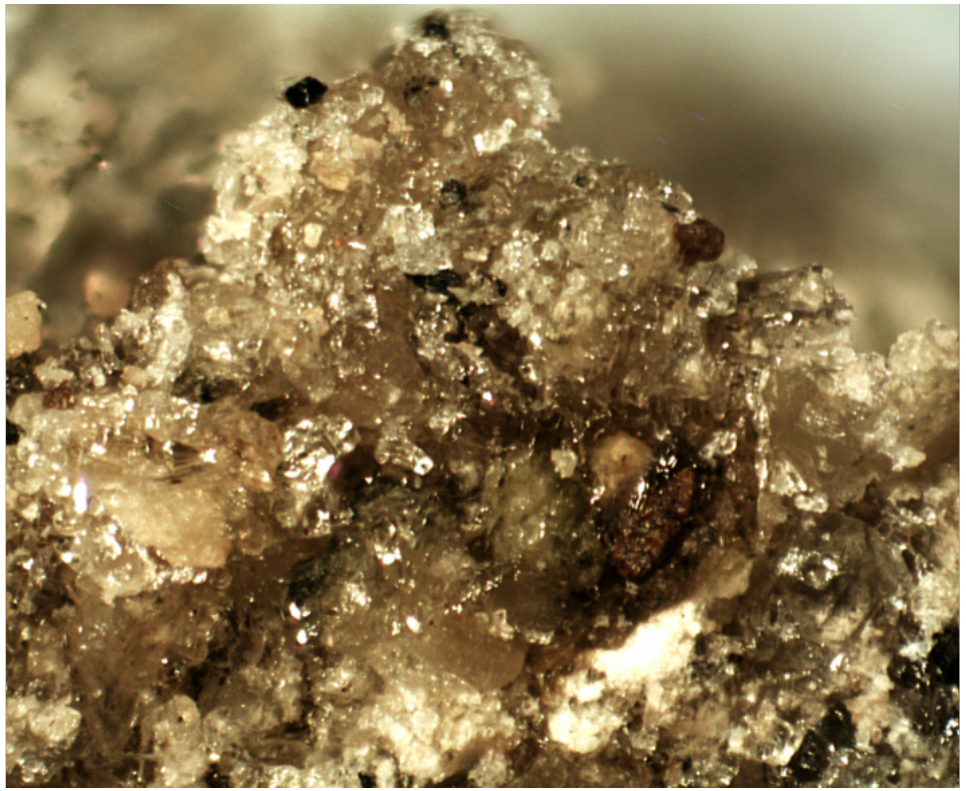
№	Element	Symbol	Concentration mg/l	Method of analysis
1	Magnesium*	Mg	113.1	Titrimetric
2	Chlorine*	Cl	323.9	Titrimetric
3	Lithium	Li	0.44	MS, AES
4	Beryllium	Be	<0.01	MS
5	Boron	B	67.0	MS, AES
6	Sodium	Na	1187	MS
7	Aluminum	Al	0.47	MS, AES
8	Silicon	Si	2.6	MS
9	Phosphorus	P	<3	MS, AES
10	Sulphur	S	135	MS
11	Potassium	K	630	MS
12	Calcium	Ca	234	MS
13	Scandium	Sc	<0.04	MS, AES
14	Titanum	Ti	<0.04	MS, AES
15	Vanadium	V	<0.2	MS, AES
16	Chromium	Cr	<0.3	MS, AES
17	Manganese	Mn	0.27	MS, AES
18	Iron	Fe	3.1	MS, AES
19	Cobalt	Co	<0.07	MS, AES
20	Nickel	Ni	0.53	MS, AES
21	Copper	Cu	<0.1	MS, AES
22	Zinc	Zn	0.49	MS, AES
23	Gallium	Ga	<0.01	MS
24	Germanium	Ge	<0.03	MS
25	Arsenic	As	<1	MS
26	Selenium	Se	<2	MS
27	Bromine	Br	6283	MS
28	Rubidium	Rb	0.2	MS
29	Strontium	Sr	8.5	MS, AES
30	Yttrium	Y	<0.004	MS
31	Zirconium	Zr	<0.01	MS
32	Niobium	Nb	<0.008	MS
33	Molybdenum	Mo	<0.03	MS
34	Ruthenium	Ru	<0.004	MS
35	Rhodium	Rh	<0.001	MS
36	Palladium	Pd	<0.02	MS
37	Silver	Ag	<0.006	MS
38	Cadmium	Cd	<0.01	MS
39	Tin	Sn	<0.01	MS
40	Antimony	Sb	<0.004	MS
41	Tellurium	Te	<0.06	MS
42	Caesium	Cs	<0.003	MS
43	Barium	Ba	0.2	MS, AES
44	Lanthanum	La	<0.002	MS
45	Cerium	Ce	<0.006	MS
46	Praseodymium	Pr	<0.004	MS
47	Neodimium	Nd	<0.006	MS
48	Samarium	Sm	<0.003	MS
49	Europium	Eu	<0.005	MS
50	Gadolinium	Gd	<0.003	MS
51	Terbium	Tb	<0.001	MS
52	Dysprosium	Dy	<0.004	MS
53	Holmium	Ho	<0.001	MS
54	Erbium	Er	<0.003	MS
55	Thulium	Tm	<0.002	MS
56	Ytterbium	Yb	<0.003	MS
57	Lutecium	Lu	<0.001	MS
58	Hafnium	Hf	<0.001	MS
59	Tantalum	Ta	<0.002	MS
60	Tungsten	W	<0.011	MS
61	Rhenium	Re	<0.008	MS
62	Osmium	Os	<0.02	MS
63	Iridium	Ir	<0.011	MS
64	Platinum	Pt	<0.009	MS
65	Gold	Au	<0.06	MS
66	Mercury	Hg	<0.02	MS
67	Thallium	Tl	<0.007	MS
68	Lead	Pb	0.021	MS
69	Bismuth	Bi	0.83	MS
70	Thorium	Th	<0.002	MS
71	Uranium	U	<0.002	MS
* - concentration, g/l				

(c) Spasov, 2003; Spasov et al., 2017

Bischofite vs Dead Sea salt

Source	Total dissolved solids, ‰	Mg, g/l	Reference
Bishofite brine (Volgograd region, Narimanovskaya well, age P1kg, depth 1623-1640 m)	**458**	**113,1**	Spasov, 2003
Dead Sea brine (Perazim Valley (near the SW shore of the Dead Sea)	**324**	**43,6**	Stein et al, 1997 Lopatina, 2016

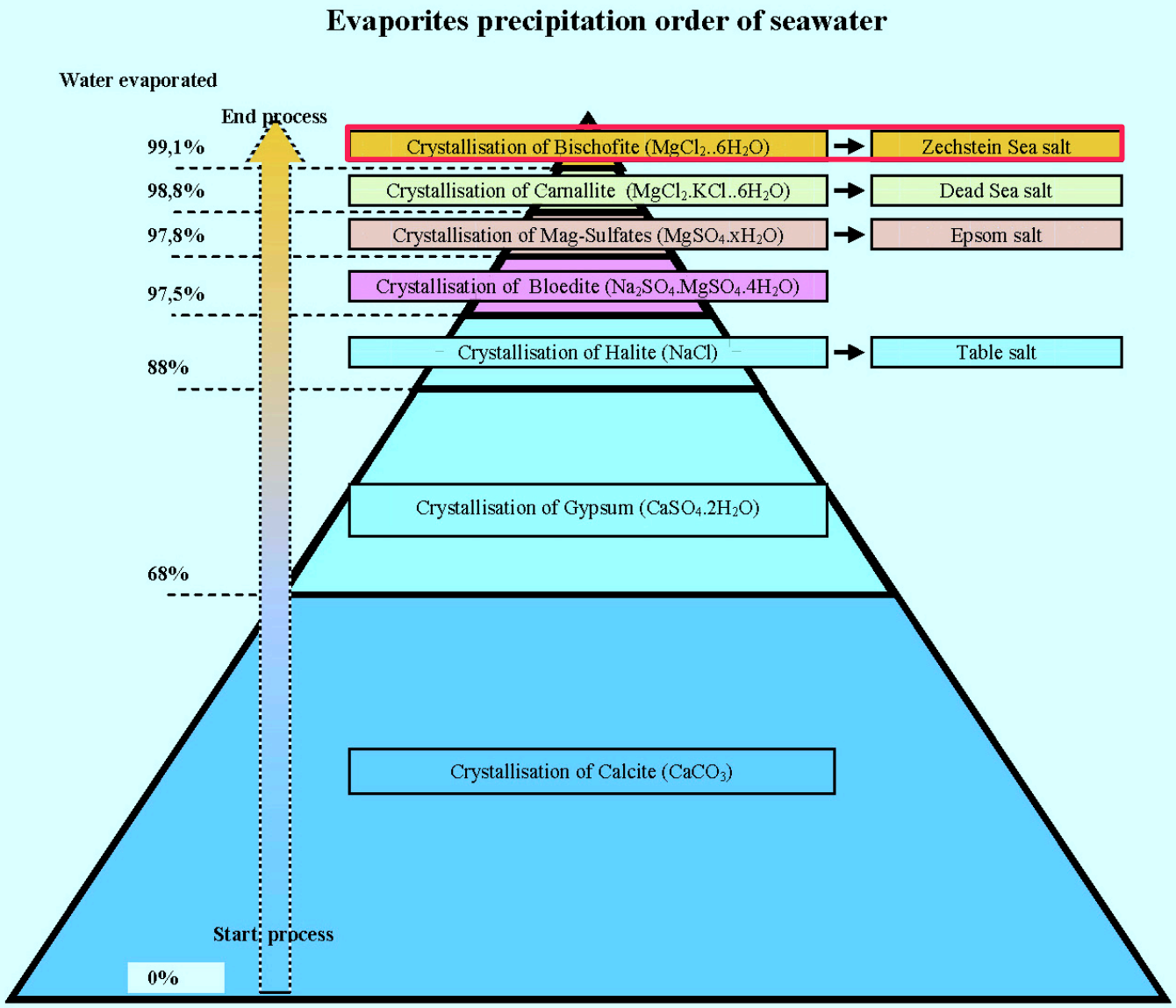
Bischofite from Raul Mine, Raúl-Condestable Mine, Cañete Province, Lima, Peru



https://www.mindat.org/min-681.html

Formation of mineral deposits of bischofite

- Bischofite forms in the **last evaporation step** after all potassium chloride has precipitated (as Carnallite) where still magnesium chloride remains.

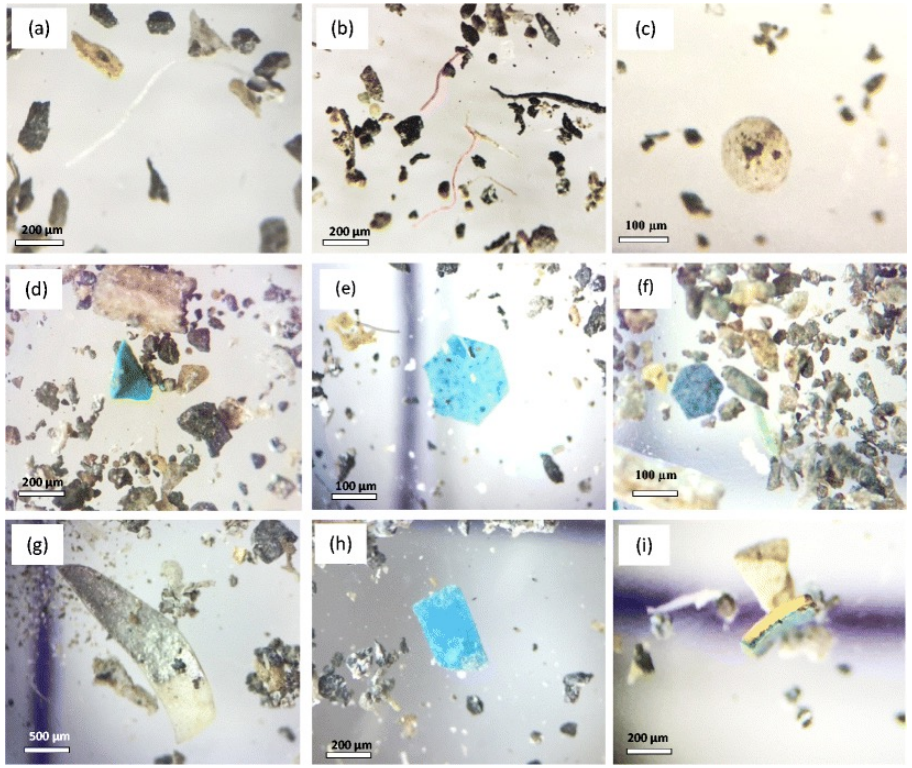


http://www.ancientmagnesium.nl/contents/pt/about.html

Microplastic

- Moreover, the big advantage of bischofite is the absence of microplastics.

Source	Microplastic, n/kg	Reference
Bischofite	**0**	http://www.ancientmagnesium.nl/contents/pt/about.html
Dead Sea salt	**700**	https://www.zavit.org.il/intl/en/uncategorized/israeli-scientists-find-large-amounts-of-microplastics-in-table-salt/ Van der Hal et al., 2016



https://www.researchgate.net/figure/The-optical-microscope-image-of-microplastics-a-Transparent-fiber-b-red-fiber-c_fig4_318421536

Localities for bischofite

https://www.mindat.org

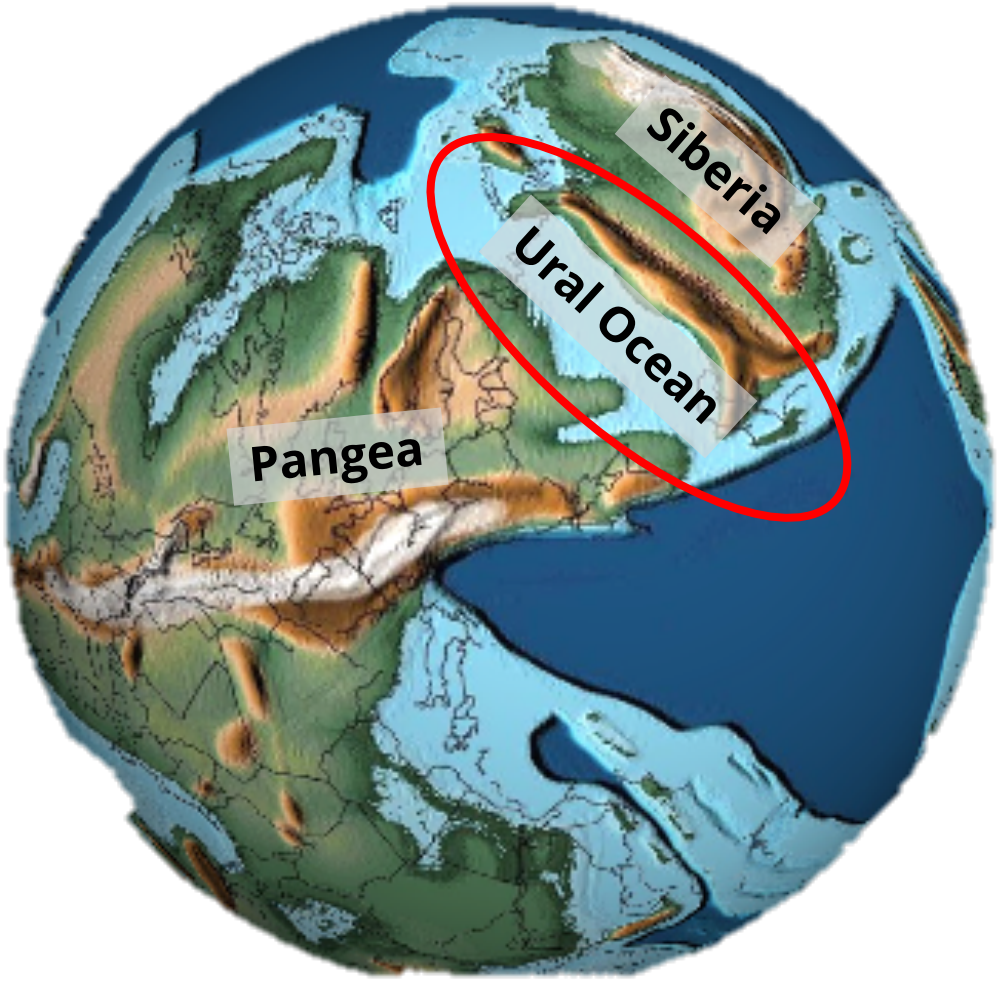
Localities for bischofite

https://www.mindat.org

Time of formation

- The Volga bischofite deposits are the sediments of the ancient **Ural Ocean**.
- The formation of bischofite deposits occurred in the **Permian period** (in the Kungur age – 283-273 million years ago).

Permian period (280 million years ago)



https://dinosaurpictures.org/ancient-earth#280

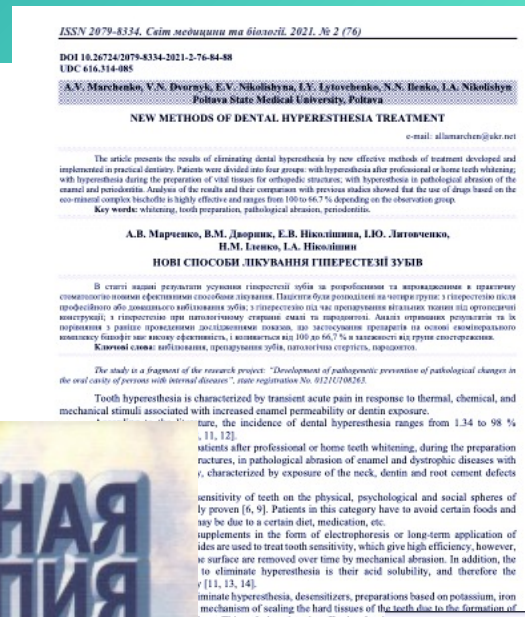
The history of the discovery of the therapeutic effect of bischofite

- In Russia, **drillers** were the first to discover bischofite deposits while drilling exploratory oil wells in the Volga region in the 50s of the 20th century.
- They were also the first to feel the healing effect of the mineral.
- They experienced a decrease in pain and inflammatory effects in the joints after frequent contact with bischofite brines.

Study of the therapeutic effect of bischofite

Then the healing effect of bischofite was studied by groups of scientists from

- Volgograd State Medical University,
- Orenburg State University,
- Stavropol State Medical University,
- Pyatigorsk State Pharmaceutical Academy,
- Poltava State Medical University, Ukraine etc.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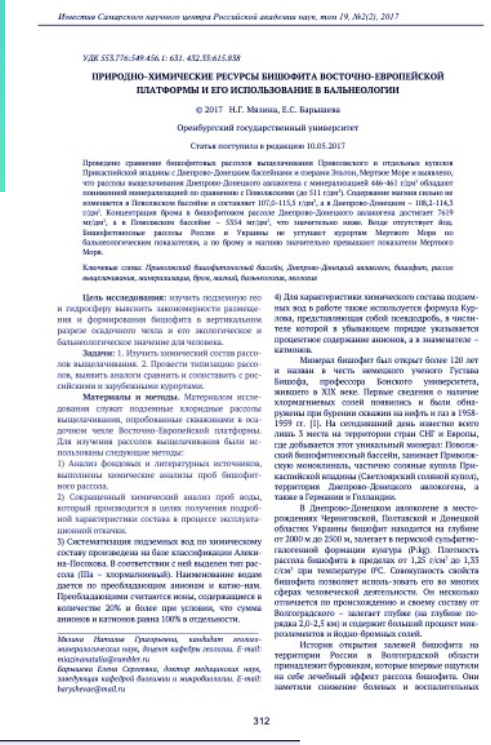
A.V. Marchenko, V.N. Dvornyk, E.V. Nikolishyna, I.Y. Lytovchenko, N.N. Ilenko, I.A. Nikolishyn
Poltava State Medical University, Poltava

NEW METHODS OF DENTAL HYPERESTHESIA TREATMENT


Известия Самарского научного центра Российской академии наук, том 19, №2(2), 2017

УДК 553.776:549.456.1:631. 432.33:615.838

ПРИРОДНО-ХИМИЧЕСКИЕ РЕСУРСЫ БИШОФИТА ВОСТОЧНО-ЕВРОПЕЙСКОЙ ПЛАТФОРМЫ И ЕГО ИСПОЛЬЗОВАНИЕ В БАЛЬНЕОЛОГИИ

RESTORATIVE TREATMENT OF PARODONTAL PATHOLOGY WITH THE USE OF NATURAL MINERALS

Pharmacological properties

- **Anti-inflammatory effect**
- Immunotropic effect
- Antimicrobial effect
- Wound healing effect

The data on the influence of bischofite and Polyminerol on the phlogogenic effect of the agents causing an inflammatory edema are presented in fig. 3.

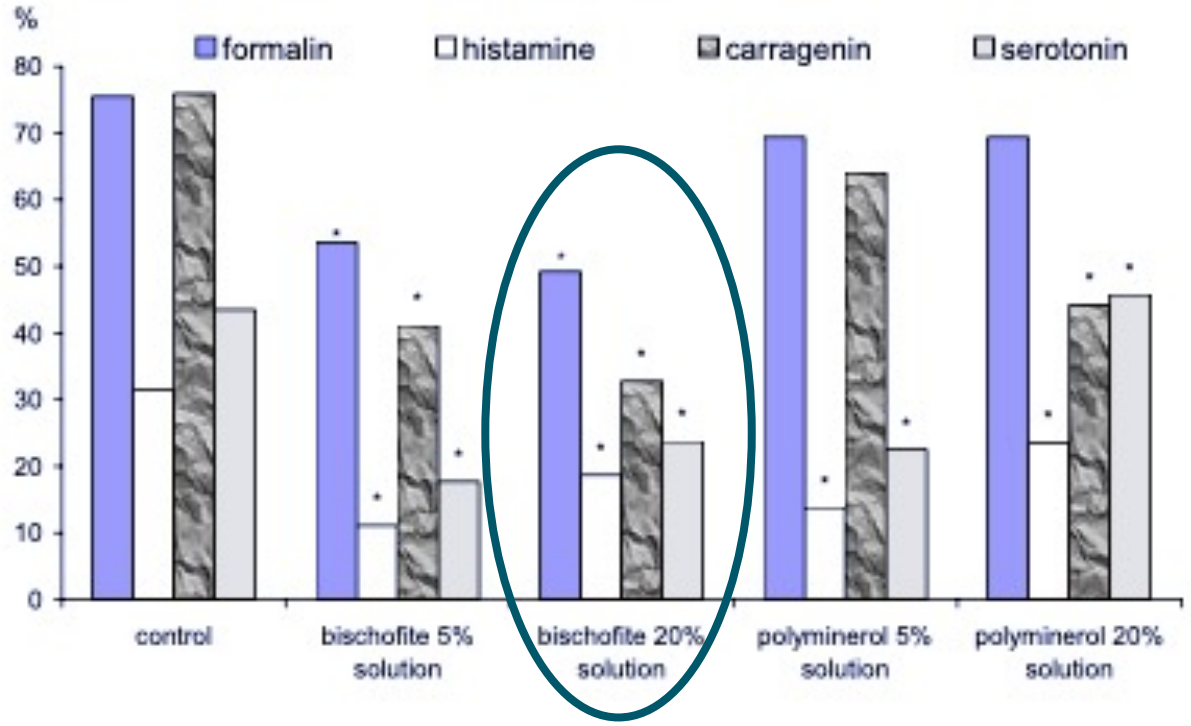


Fig 3. The Effect of Bischofite Brine and Polyminerol on the Size of the Edema of the Rat's Hind Leg Induced by Phlogogenic Agents (Formalin, Carragenin, Serotonin, Histamine)

* - the data are statistically relevant as to the control (P<0,05)

Pharmacological properties

- Anti-inflammatory effect
- **Immunotropic effect**
- Antimicrobial effect
- Wound healing effect

The immunotropic effect was revealed. Bischofite caused a substantial in the number of antibody-forming cell in the spleen.

The Effect of Bischofite Standardized Solution on the Cellular Composition of Spleenocytes, their Functional Activity, the Stimulation of Antibody Formation and the Concentration of Lysozyme (M±m)

№	Indices	Control group n=6	Experimental group n=6
1	The concentration of lymphocytes in the spleen, mln cells	33,5±3,2	26,5±3,4
2	The concentration of T-lymphocytes in the spleen, % of the total number of lymphocytes	39,2±3,8	40,2±3,4
3	The concentration of B-lymphocytes in the spleen, % of the total number of lymphocytes	23,2±2,8	28,9±4,5
4	Transferative activity of lymphocytes on phytohemagglutinin (PHA), stimulation index (SI)	25,7±8,8	19,6±8,0
5	Proliferative activity of lymphocytes on mitogen laconos (ML) and stimulation index (SI)	12,2±3,6	13,8±4,2
6	The number of antibody-forming cells (AFC) in the spleen, AFC/mln lymphocytes	35,3±7,7	93,7±20,2*
7	The number of antibody-forming cells (AFC) in the spleen, AFC/spleen	1103,7±202,1	2623,7±673,4*
8	The concentration of lysozyme in blood serum (mkg/ml)	4,52±0,63	6,73±0,77*

* - the data are true as to the control p<0,05

n - the number of animals in the group

Pharmacological properties

- Anti-inflammatory effect
- Immunotropic effect
- **Antimicrobial effect**
- Wound healing effect

It was established that bischofite brine with 30% concentration fully inhibits the growth of some microorganisms.

Bischofite Effect on the Growth of Opportunistic Microorganisms in Liquid Nutrient Media

Concentration in the medium, %	The growth of microorganisms with the inoculation dose of, m.b./ml of the medium								
	Staphilococcus Aureus			Streptococcus Mutans			Candida albicans		
	10^6	10^4	10^2	10^6	10^6	10^2	10^6	10^4	10^2
Control	+	+	+	+	+	+	+	+	+
30	0	0	0	0	0	0	0	0	0
20	+	0	0	+	+	0	0	0	0
10	+	+	0	+	+	+	+	0	0
5	+	+	+	+	+	+	+	+	+

Nomenclature: + - growth in the broth

0 - absence of growth in the broth

(c) Spasov, 2003; Spasov et al., 2017

Pharmacological properties

- Anti-inflammatory effect
- Immunotropic effect
- Antimicrobial effect
- **Wound healing effect**

The wound healing effect has been proven. Figure shows that bischofite-base remedy makes the 50% reduction of the ulcerous area.

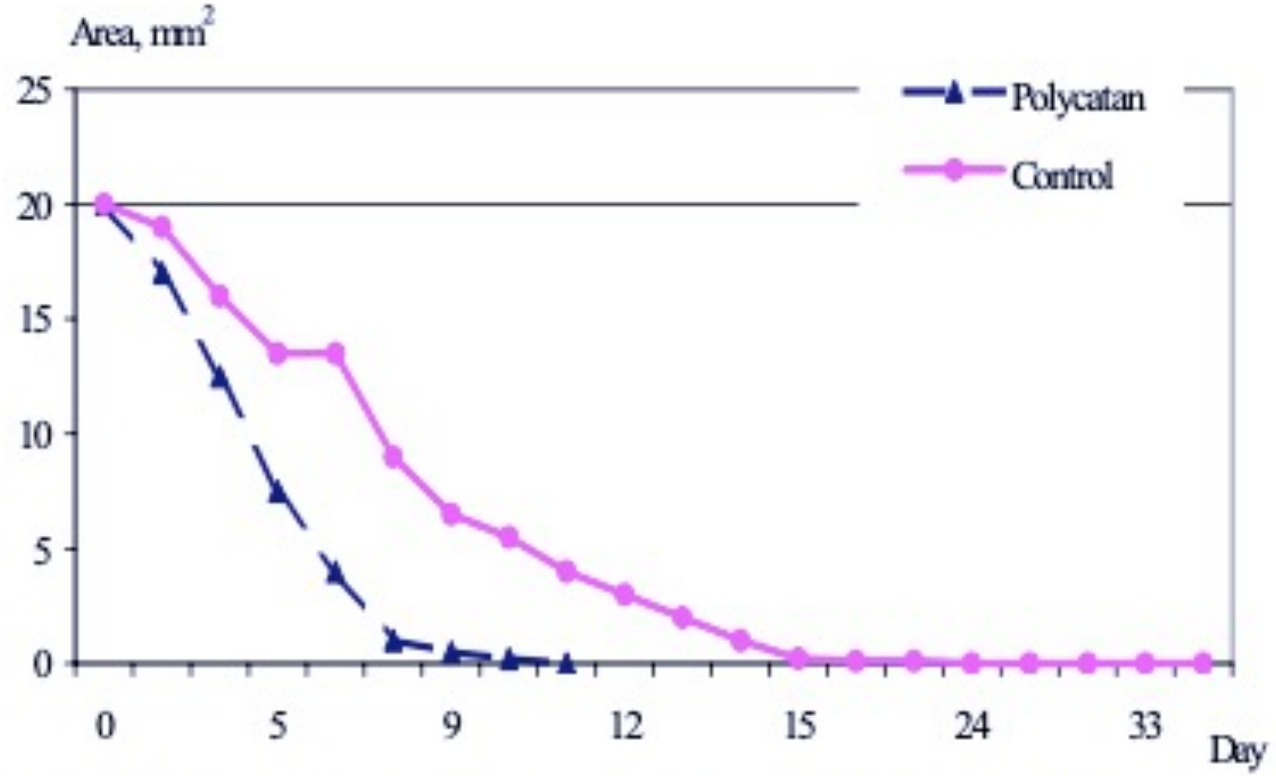


Fig. 6. The Effect of Polycatan on the Thermal Ulcer of the Nasal Mucous Membrane

* Polycatan – bischofite-based remedy (20%)

Hygiene remedies based on bischofite

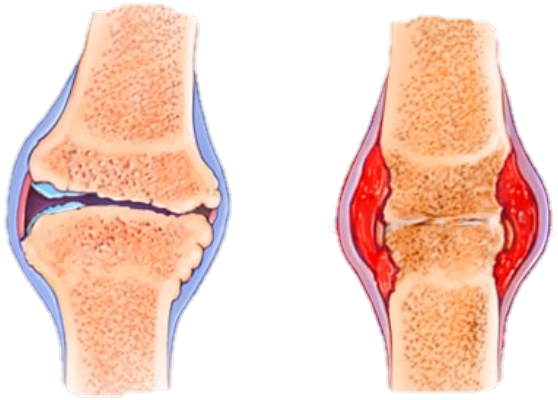
- Based on the results of the experiments, various hygienic and balneological **remedies** with bischofite were developed.

- They have been used in the treatment of various diseases in clinical practice since the 1980s.

Clinical data

Diseases of the musculoskeletal system

- Rheumatoid arthritis
- Osteoarthritis
- Arthrosis
- Gout
- Ankylosing spondylitis
- Reiter's disease etc.

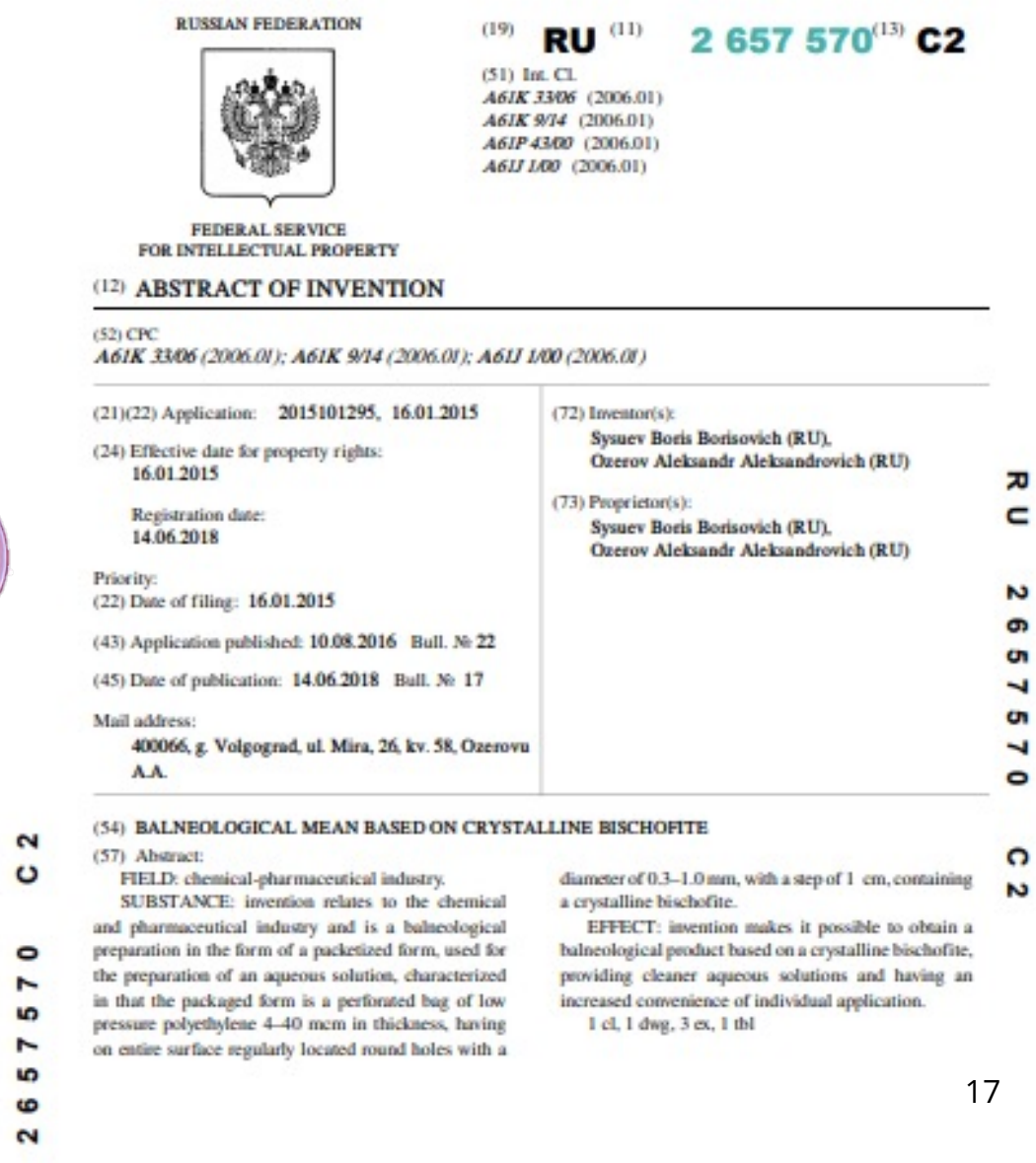


(c) Sysuev et al, 2015

(c) Zborovskii et al, 1991, 2003, 2016

(c) Mamasaidov et al, 1999

(c) Shaveleva, 1995, 2014



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A61J 1/00 (2006.01)

(12) **ABSTRACT OF INVENTION**

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***A61K 33/06** (2006.01); **A61K 9/14** (2006.01); **A61J 1/00** (2006.01)*

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(73) Proprietor(s):
Sysuev Boris Borisovich (RU),
Ozerov Aleksandr Aleksandrovich (RU)

(54) **BALNEOLOGICAL MEAN BASED ON CRYSTALLINE BISCHOFITE**

(57) Abstract:

FIELD: chemical-pharmaceutical industry.

SUBSTANCE: invention relates to the chemical and pharmaceutical industry and is a balneological preparation in the form of a packetized form, used for the preparation of an aqueous solution, characterized in that the packaged form is a perforated bag of low pressure polyethylene 4–40 mcm in thickness, having on entire surface regularly located round holes with a diameter of 0.3–1.0 mm, with a step of 1 cm, containing a crystalline bischofite.

EFFECT: invention makes it possible to obtain a balneological product based on a crystalline bischofite, providing cleaner aqueous solutions and having an increased convenience of individual application.

1 cl, 1 dwg, 3 ex, 1 tbl

RU 2657570 C2

2657570 C2

Clinical data

Dental diseases

- Stomatitis
- Periodontitis
- Parodontosis
- Gingivitis
- Sensitive teeth etc.

- The **remineralizing ability** of bischofite has been revealed.
- The components of bischofite contribute to the recrystallization of hydroxyapatite and the filling of intercrystalline spaces in the hard tissues of teeth.

* Hydroxyapatite – the main mineral component of tooth enamel

(c) Marchenko , 2021

(c) Sasuev et al, 2017

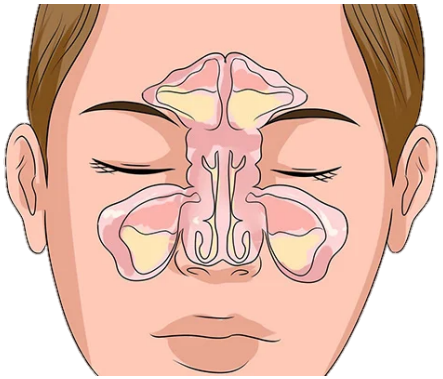
(c) Dvornyk et al, 2020

(c) Petrushanko, 2018

Clinical data

Otolaryngologic Diseases

- Tonsillit
- Sinusitis
- Rhinitis
- Maxillitis
- Pharyngitis etc.



Effectiveness of Polycatan therapy of inflammatory diseases of nasal mucosa and paranasal sinuses

№	Diseases	№ of patients	Outcome of treatment							
			Recovery		Improvement		Aggravation		No effect	
			Abs	%	Abs	%	Abs	%	Abs	%
1	Acute maxillitis	11	11	100	0	0	0	0	0	0
2	Chronic maxillitis	26	3	11.5	22	84.6	0	0	1	3.9
3	Chronic frontitis	7	1	14.2	6	85.7	0	0	0	0
4	Chronic hyperplastic maxilloethmoiditis	18	0	0	17	94.4	0	0	1	5.6
5	Chronic rhinitis	22	4	18.2	16	72.7	0	0	0	9.1

(c) Spasov, 2003

(c) Martynova, 1999

(c) Lobzov, 1999

* Polycatan – bischofite-based remedy (20%)

Clinical data

Ophthalmological diseases

- Bischofite-based eye drops are useful as a stimulator of corneal repair after injuries and surgical interventions.

(c) Sysuev et al, 2011

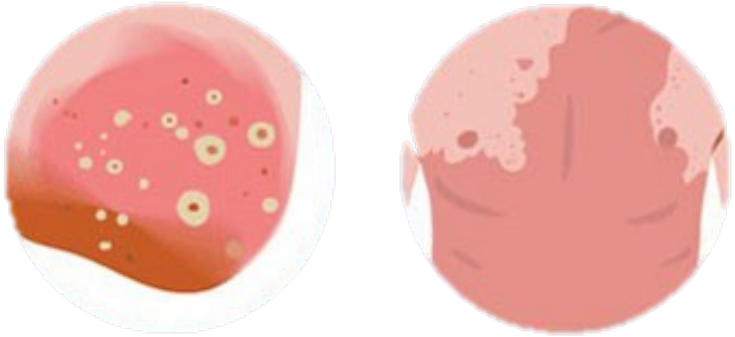
(c) Spasov et al, 2012

Clinical data

Skin diseases

Bischoline* therapy **effective** with:

- Psoriasis
- Scleroderma
- Impetigo vulgaris



(c) Spasov, 2003

(c) Mashkovskii, 1997

Bischoline* therapy **ineffective**** with:

- Eczema
- Atopic dermatitis
- Acne conglobate
- Rosacea
- Pemphigus vulgaris
- Devergie's lichen

* Bischoline – bischofite with carboxymethylcellulose

** It has a local irritating effect

Toxicological properties of bischofite

- The obtained acute toxicology value of standardized bischofite brine LD_{50} enables one to classify as a substance of **low toxicity**.

Acute toxicity (LD50) of bischofite and its derivatives upon its intragastric administration to rats

Preparation	LD_{50} value (ml/kg/~mg/kg of dry residual)	
	Females	Males
Pharmacopeic bischofite (20% solution)	55.0/~4950.0	19.7/~1773.0
Balneological bischofite purified from technological admixtures (20% solution)	30.6/~2666.5	26.5/~2305.0
Crystallised bischofite	1412±227.0**	-
Dry bischofite	2200.0±500.0**	-
Polycatan (20% solution)	11.0/~840.4	16.0/~1222.4
Bischolin	11.5	12.6
Polycatan ointment	13.5	13.6
Polycatan forte ointment	8.9	8.9
Polycatan analgesic ointment	8.1	8.5

** in mg/kg

(c) Spasov, 2003; Spasov et al., 2017

Conclusion

- Bischofite is an affordable, common **magnesia mineral**.
- Bischofite has **low toxicity** and rare manifestations of an allergenic effect.
- It has been proven that bischofite solutions are effective as **anti-inflammatory, wound healing and antibacterial agents** for the treatment of purulent wounds, ophthalmic diseases, arthritis, arthrosis, etc.
- In general, bischofite is actively used in **balneotherapy, cosmetology**, the creation of **medicines**.

https://www.mindat.org/min-681.html

Conclusion

- The influence of bischofite on the human body, especially among **miners** and people living near salt deposits, **need to be studied in more detail**.

https://www.mindat.org/min-681.html

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Thank you for your attention!

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