МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ИМЕНИ. М. В. ЛОМОНОСОВА

СЕРТИФИКАЦИОННЫЙ КОНТРОЛЬНО-АНАЛИТИЧЕСКИЙ ЦЕНТР
(Свидетельство об аккредитации № РОСС RU.0001.511201,
Лицензия Госкомэкологии РФ: Г-187815, рег/н 98/0092/021/Л)
Адрес: 119899, Россия, Москва, ГСП-5, Ленинские горы, МГУ,
д. 1, корп. 3, Химический факультет, тел.: 939-13-82, 939-52-60.

FINAL REPORT

Outlook for USVR filter medium application for potable water purification

The experimental filter sample with new USVR sorbent (filter layer thickness - 8 cm) under test was found to be high-effective according to the main parameters for the potable water-index (tap, well, pure natural) standardized by SANPIN.

Method of standard additions (component dilution using standard samples) was applied for some components which were absent in water samples under investigation. The results are presented in the Quantitative Chemical Analysis reports № 2116, 2117 and 2118 (02/10/2000).

According to the test results USVR was found to be high-effective universal sorbent for the greatest part of SANPIN water-index parameters. All water types (tap, well, pure natural) being tested were found to be satisfactory after purification in compliance with SANPIN index 2.1.4.559-96 for potable water.

Center Chief,
Dr. Sci., Professor

O.A.Shpigun

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**Address: Chemistry Department, Building 3,
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EXPERT CONCLUSION

ON PROSPECTS OF THE USE OF USVR MATERIAL FOR THE PURIFICATION OF POTABLE WATER (TAP WATER, WELL WATER AND ARTESIAN WELL WATER)

THE EXPERIMENTAL FILTER SPECIMEN USED IN THE TESTS, IN WHICH A NEW **USVR** SORBENT HAS BEEN USED AS A FILTRATION ELEMENT (FILTER LAYER THICKNESS IS 8 CM) HAS SHOWN A HIGH EFFECTIVENESS BY THE MAJORITY OF MOST IMPORTANT PARAMETERS FOR POTABLE (TAP, WELL ARTESIAN WELL) WATER TO BE REGULATED BY **SANPIN**. FOR SOME PARAMETERS, THE METHOD OF ADDITIVES HAS BEEN USED (DILUTION OF COMPONENTS FROM **SSS**). THE RESULTS OF TESTS ARE GIVEN IN QCA REPORTS NOS. 2116, 2117 AND 2118 DATED 10TH FEBRUARY 2000.

THE **USVR** MATERIAL BY RESULTS OF THE TESTS HAS SHOWN ITSELF AS A HIGH-EFFECTIVE UNIVERSAL SORBENT FOR MOST OF THE PARAMETERS TO BE REGULATED BY **SANPIN**; AT THAT ALL THREE TYPES OF FILTERED TYPES OF WATER (TAP, WELL AND ARTESIAN WATER) AFTER FILTRATION MEET THE **SANPIN** REQUIREMENTS 2.1.4.559-96 FOR POTABLE WATER.

FILTERS BASED ON THIS SORBENT (**USVR**) CAN BE RECOMMENDED FOR HIGH-EFFECTIVE PURIFICATION OF TAP WATER, WELL AND ARTESIAN WELL WATER.

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QCA Report No. 2175 dated 13.03.2000

1. Name of object: Water – initial and after passing through filter.

2. Customer:

3. Sample code:

4. Sample delivery date:

5. Analysis conduction date: 9, 10.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results			4	Note
		1	2	3		
1.	Initial, 0 l	1.06	0.59	1.48	4.4	
2.	After filter, 1 l	0.08	0.30	0.73	1.8	
3.	After filter, 20 l	0.08	0.30	0.73	1.8	
4.	After filter, 40 l	0.08	0.30	0.75	1.8	
5.	After filter, 50 l	0.08	0.30	0.75	1.8	
6.	After filter, 100 l	0.09	0.30	0.78	1.9	
7.	After filter, 150 l	0.09	0.31	0.8	1.9	
8.	After filter, 200 l	0.09	0.33	0.96	2.0	
9.	After filter, 250 l	0.1	0.37	1.12	2.0	
10.						

1 – Iron gen., mg/l
2 – Nitrogen ammonium, mg/l
3 – Copper gen., mg/l
4 – Permanganate oxidability, mg O_2/l

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QCA Report No. 2174 dated 13.03.2000

1. Name of object: Water – initial and after passing through filter.

2. Customer:

3. Sample code:

4. Sample delivery date:

5. Analysis conduction date: 9, 10.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results			Method of analysis	Note
		1	2	3		
1.	Initial, 0 l	0.5	2.55	2.4		
2.	After filter, 1 l	n/d	1.06	1.3		
3.	After filter, 20 l	n/d	1.06	1.3		
4.	After filter, 40 l	n/d	1.06	1.3		
5.	After filter, 50 l	n/d	1.08	1.3		
6.	After filter, 100 l	n/d	1.1	1.4		
7.	After filter, 150 l	n/d	1.1	1.4		
8.	After filter, 200 l	<0.05	1.13	1.5		
9.	After filter, 250 l	0.06	1.28	1.5		
10.						

1 – Chloroform, mg/l
2 – Non-organic copper, mg/l
3 – Permanganate oxidability, mg O_2/l

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QCA Report No. 2166 dated 28.02.2000

1. Name of object: Waste water of OAO Nefteprodukt.

2. Customer: Scientific & Research Institute on Physics of Fullerenes

3. Sample code: Before filter.

4. Sample delivery date: 25.02.2000.

5. Analysis conduction date: 27.02.2000.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	pH	7.05	Potent.	
2.	Phenols	0.11	Chromat.	
3.	Oil products	86.6	IR	
4.	Benzopyren	0.8 mg/l	Chromat.	
5.	Hydroquinone	2.5	Chromat.	
6.	Phenol-carboxylic acid	63	Chromat.	
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QCA Report No. 1919 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 4 – Tarakanovka river.

4. Sample delivery date: 09.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.780	IR	Before
2.	Permanganate oxidability	12.1 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.050	IR	After
5.	Permanganate oxidability	5.6 mg O_2/l	Titr.	filter
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EXPERT CONCLUSION

UPON RESULTS OF RESOURCE TESTS OF FILTER MODELS BASED ON THE USVR MATERIAL FOR THE PURIFICATION OF POTABLE WATER

UPON RESULTS OF OUR PREVIOUS INVESTIGATIONS, THE **USVR** MATERIAL HAS SHOWN ITSELF AS S FILTRATION AGENT FOR THE PURIFICATION OF POTABLE WATER FROM ORGANIC AND METAL-ORGANIC CHEMICAL COMPOUNDS (FOR EXAMPLE, IRON HUMATES) BEING INCLUDED INTO THE **SANPIN** LIST. ON THIS BASIS, THE TESTING PARAMETERS HAVE BEEN CHOSEN AT THE CONDUCTION OF RESOURCE TESTS.

THE FILTER MODEL TESTED HAS DEMONSTRATED PRACTICALLY UNCHANGED HIGH DEGREE AT PASSING OF 200 L OF WATER BY CHLOROFORM, IRON, NITROGEN AMMONIUM AND SUM OF ORGANIC SUBSTANCES.

FOR RESOURCE TESTS, TAP WATER HAS BEEN USED WITH ADDITIVES OF CHLOROFORM AND COPPER (REPORT NO. 2174) AND REAL TAP WATER OF THE TOWN OF RAMENSKOYE (REPORT NO. 2175).

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QCA Report No. 1918 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 3 – Chura river.

4. Sample delivery date: 09.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.400	IR	Before
2.	Permanganate oxidability	7.8 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.041	IR	After
5.	Permanganate oxidability	4.2 mg O_2/l	Titr.	filter
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QCA Report No. 1917 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 2 – Nishchenka river.

4. Sample delivery date: 09.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.340	IR	Before
2.	Permanganate oxidability	6.8 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.035	IR	After
5.	Permanganate oxidability	4.2 mg O_2/l	Titr.	filter
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QCA Report No. 1916 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 1 – Maryinskiy Park.

4. Sample delivery date: 14.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.120	IR	Before
2.	Permanganate oxidability	5.1 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.010	IR	After
5.	Permanganate oxidability	2.6 mg O_2/l	Titr.	filter
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1	2	3	4	5	6	7
13	Phosphorus general	58.2	39.0	2.3		25
14	COD (g O_2/l)	20.8	13.44	10.4	15	2
15	PO	644	452	338	5	2
16	BOD(mg O_2/l)	5.1	3.4	2.5	3.0	2
17	Carbon general (g/l)	7.6	4.0	3.7		2
18	Solid residual (g/l)	4.8	5.5	6.2		
19	Hardness general	5.08	11.9	10.52	7.0	
20	Calcium	3.2/64.0	5.84/116.8	5.94/118.8	200	1
21	Magnesium	1.88/22.8	6.06/73.6	4.58/56.7		
22	Sulphites	670	580	650	500	
23	Chlorides	1800	1880	1700	350	
24	pH (units)	7.25	6.91	7.54		

Note.

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EXPERT CONCLUSION

UPON RESULTS OF RESOURCE TESTS OF FILTER MODELS BASED ON THE USVR MATERIAL WITH ADDITIVES OF AERATING AGENTS AND CATION-EXCHANGERS FOR THE PURIFICATION OF POTABLE WATER

UPON RESULTS OF OUR PREVIOUS INVESTIGATIONS, THE **USVR** MATERIAL HAS SHOWN ITSELF AS S FILTRATION AGENT FOR THE PURIFICATION OF POTABLE WATER FROM ORGANIC AND METAL-ORGANIC CHEMICAL COMPOUNDS (FOR EXAMPLE, IRON HUMATES) BEING INCLUDED INTO THE **SANPIN** LIST. IN ORDER TO WIDEN THE SPECTRUM OF ECOTOXICANTS BEING ABSORBED BY THE FILTER AND INCREASE ITS RESOURCE, THE ADDITIVES OF AERATING AGENTS AND CATION-EXCHANGERS HAVE BEEN INTRODUCED. ON THIS BASIS, THE TESTING PARAMETERS HAVE BEEN CHOSEN AT THE CONDUCTION OF RESOURCE TESTS.

THE FILTER MODEL TESTED HAS DEMONSTRATED PRACTICALLY UNCHANGED HIGH DEGREE AT PASSING OF 500 L OF WATER BY CHLOROFORM, IRON, NITROGEN AMMONIUM, SUM OF ORGANIC SUBSTANCES, COPPER AND SULPHIDE.

FOR RESOURCE TESTS, TAP WATER HAS BEEN USED WITH ADDITIVES OF CHLOROFORM AND COPPER (REPORT NO. 2174) AND REAL TAP WATER OF THE TOWN OF RAMENSKOYE (REPORTS NOS. 2175, 2210-2216).

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EXPERT CONCLUSION

upon results of analysis of natural potable water in the area of the Baikonur space-vehicle launching site

ON THE BASIS OF CONDUCTED CHEMICAL ANALYSES OF THE COMPOSITION OF NATURAL POTABLE WATER IN THE AREA OF THE BAIKONUR SPACE-VEHICLE LAUNCHING SITE (THE QUANTITATIVE CHEMICAL ANALYSIS REPORTS ARE ATTACHED), A CONCLUSION CAN BE MADE THAT THIS WATER CONTAIN A NUMBER OF COMPONENTS IN SUCH CONCENTRATIONS, WHICH MAKE THEM UNSAFE FOR HUMAN HEALTH AT THE USE AS POTABLE WATER.

THE INVESTIGATIONS CONDUCTED HAVE SHOWN THAT IT IS POSSIBLE TO CHOSE FILTRATION ELEMENTS IN CARTRIDGES OF DOMESTIC FILTER OF THE "BARRIER" TYPE FOR A COMPLETE NORMALISATION OF WATER PARAMETERS OVER ALL PARAMETERS BEING NORMALISED. SO AFTER PASSING OF INITIAL WATER THROUGH A COMBINED FILTER FROM A NEW SORBING MATERIAL – **USVR**, THE COMBINATIONS OF CATION-EXCHANGER AND ANION-EXCHANGER IN THE POTASSIUM, SODIUM AND CHLORINE FORMS, WATER IS IN FULL COMPLIANCE WITH ALL REGULATORY DOCUMENTS FOR POTABLE WATER ESTABLISHED BY **SANPIN** OF THE RUSSIAN FEDERATION. BASING ON THESE FILTRATION ELEMENTS, ONE CAN ALSO MANUFACTURE MORE POWERFUL INDUSTRIAL HIGH-PERFORMANCE FILTERS.

IN ADDITION, USING THIS RE-GENERANT IN THE POTASSIUM-SODIUM FORM, WE MANAGED, PARALLEL WITH SOLUTION OF MAIN PROBLEMS OF PURIFICATION OF THIS WATER, TO DECREASE THE SODIUM CONTENT IN WATER REDUCING IT THE ESTABLISHED STANDARD PARAMETER VALUES. IT MEANS THAT THIS FILTER CAN BE RECOMMENDED FOR THE PURIFICATION OF BOTH NORMAL AND HARD WATER IN DOMESTIC (HOUSEHOLD) CONDITIONS; AT THAT THE SODIUM CONTENT IN WATER REMAIN WITHIN THE PERMISSIBLE STANDARD LIMITS.

IT HAS BEEN ESTABLISHED THAT THE TOTAL MICROBE NUMBER IN THE RIVER WATER EXCEEDS THE REGULATORY PARAMETERS; HOWEVER NO PATHOGENIC MICROBES HAVE BEEN DETECTED IN THEM. THE PROBLEM OF REDUCTION OF THE TOTAL NUMBER UP TO THE STANDARD VALUE CAN BE EASILY SOLVED BOTH IN INDUSTRIAL AND IN DOMESTIC CONDITIONS BY WELL-ELABORATED STANDARD METHODS. SO THE INSTALLATION OF A PRELIMINARY FILTER FROM ANION-EXCHANGING ION-CONTAINING RESINS REDUCES THE TOTAL MICROBE NUMBER TO THE STANDARD VALUE; IN THIS CASE THE OUTLET WATER AFTER THE FILTER DOES NOT CONTAIN FREE IODINE.

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Address: Chemistry Department, Building 3,
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Moscow, 119899, Russia. Tel.: 939-13-82, 939-52-60.

QCA Report No. 2216 dated 03.04.2000

1. Name of object: Water.

2. Customer: Scientific & Research Institute on Physics of Fullerenes.

3. Sample code: Initial.

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	4.3 mg O_2/l	Titr.	5.0
2.	Ammonium	2.8	s/f	2.5
3.	Copper	1.6	AAS	0.1
4.	Sulphide	0.18	s/f	0.003
5.				
6.				
7.				
8.				
9.				
10.				

Head of the Centre *(signature)* **O. A. Shpigoun**
Doctor of Chemical Sciences
Professor

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Executed by: A. A. Ivanov, Cand. Chem. Sc.

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Moscow, 119899, Russia. Tel.: 939-13-82, 939-52-60.

QCA Report No. 2118 dated 10.02.2000

1. Name of object: Water.

2. Customer: Rasskazovka.

3. Sample code: Well.

4. Sample delivery date: 09.02.2000.

5. Analysis conduction date: 10.02.2000.

6. Sample preparation.

No.	Components to be determined	Initial QCA results, mg/l	After filter QCA results, mg/l	Note MPC, mg/l
1.	Hardness	5.6	5.4	6-8
2.	Nitrites	21.0	15.8	45
3.	Sulphites	56	44	500
4.	Sulphides	0.004	0.001	0.003
5.	Nitrogen ammonium	2.7	0.48	2.5
6.	Coloration, degrees	10	1.8	20
7.	Turbidity, EMF	1.25	0.06	2.6
8.	Suspended substances	10	1.0	15
9.	Permanganate oxidability	3.2	1.0	5.0
10.	Fluorides	0.29	0.05	1.5
11	Phosphates	0.80	0.31	3.5
12.	Manganese	Not detected	Not detected	0.1
13.	Iron gen.	5.21	0.01	0.3
14.	Iron organic. (humus)	0.28	Not detected	
15.	Copper	0.01	Not detected	1.0
16.	Aluminium	0.03	Not detected	0.5
17.	Lead	Not detected	Not detected	0.03
18.	Zinc	Not detected	Not detected	5.0
19.	Chlorine residuals free	Not detected	Not detected	0.3-0.5
20.	Mineralisation	340	250	1000
21.	Chlorides	17.5	16.6	350
22.	Molybdenum	–	–	0.25

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Chemical Department.

Executed by: O. N. Perevodnikova, K. A. Ananieva, A. I. Elefterov, A. A. Ivanov, K. A. Lushov

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Address: Chemistry Department, Building 3,
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QCA Report No. 2117 dated 10.02.2000

1. Name of object: Water.

2. Customer: Town of Orekhovo-Zuyevo.

3. Sample code: Well.

4. Sample delivery date: 09.02.2000.

5. Analysis conduction date: 10.02.2000.

6. Sample preparation.

No.	Components to be determined	Initial QCA results, mg/l	After filter QCA results, mg/l	Note MPC, mg/l
1.	Hardness	4.68	4.00	6-8
2.	Nitrites	1.1	0.8	45
3.	Sulphites	1.5	Not detected	500
4.	Sulphides	0.001	Not detected	0.003
5.	Nitrogen ammonium	Not detected	Not detected	2.5
6.	Coloration, degrees	8	1.5	20
7.	Turbidity, EMF	0.6	0.02	2.6
8.	Suspended substances	1.0	0.1	15
9.	Permanganate oxidability	1.2	0.5	5.0
10.	Fluorides	0.2	Not detected	1.5
11	Phosphates	Not detected	Not detected	3.5
12.	Manganese	0.03	0.01	0.1
13.	Iron gen.	0.7	Not detected	0.3
14.	Iron organic. (humus)	Not detected	Not detected	
15.	Copper	Not detected	Not detected	1.0
16.	Aluminium	Not detected	Not detected	0.5
17.	Lead	Not detected	Not detected	0.03
18.	Zinc	0.17	0.05	5.0
19.	Chlorine residuals free	0.06	Not detected	0.3-0.5
20.	Mineralisation	210	170	1000
21.	Chlorides	2.9	2.7	350
22.	Molybdenum	–	–	0.25

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Professor

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QCA Report No. 2116 dated 10.02.2000

1. Name of object: Water.

2. Customer: Town of Ramenskoye. ZAO Medved k.

3. Sample code: Water pipeline.

4. Sample delivery date: 09.02.2000.

5. Analysis conduction date: 10.02.2000.

6. Sample preparation.

No.	Components to be determined	Initial QCA results, mg/l	After filter QCA results, mg/l	Note MPC, mg/l
1.	Hardness	5.58	5.28	6-8
2.	Nitrites	2.5	2.0	45.0
3.	Sulphites	30	20	500
4.	Sulphides	0.008	0.002	0.003
5.	Nitrogen ammonium	4.4	0.83	2.5
6.	Coloration, degrees	28	4.0	20
7.	Turbidity, EMF	117	2.0	2.6
8.	Suspended substances	79	3.0	15
9.	Permanganate oxidability	3.4	2.0	5.0
10.	Fluorides	1.03	0.87	1.5
11	Phosphates	0.14	0.08	3.5
12.	Manganese	0.070	0.012	0.1
13.	Iron gen.	8.75	0.01	0.3
14.	Iron organic. (humus)	1.36	0.03	
15.	Copper	0.04	Not detected	1.0
16.	Aluminium	2.3	0.48	0.5
17.	Lead	0.011	0.007	0.03
18.	Zinc	Not detected	Not detected	5.0
19.	Chlorine residuals free	3.00	0.03	0.3-0.5
20.	Mineralisation	350	260	1000
21.	Chloride	6.8	6.5	350
22.	Molybdenum	3.5	0.7	0.25

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Moscow, 119899, Russia. Tel.: 939-13-82, 939-52-60.

QCA Report No. 2165 dated 28.02.2000

1. Name of object: Water.

2. Customer: Scientific & Research Institute on Physics of Fullerenes

3. Sample code: After USVR filter.

4. Sample delivery date: 25.02.2000.

5. Analysis conduction date: 27.02.2000.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	pH	7.56	Potent.	
2.	Phenols	< 0.01	Chromat.	
3.	Oil products	0.05	IR	
4.	Benzopyren	< 0.005 μg/l	Chromat.	
5.	Hydroquinone	0.5	Chromat.	
6.	Phenol-carboxylic acid	11	Chromat.	
7.				
8.				
9.				
10.				

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CONCLUSION

The highest degree of purification of initial water (tap water of the town of Ramenskoye, Moscow region) has been reached at the use of the filter from USVR.

After this filter there is no MPC exceedance for any parameter.

After the "Barrier" filter, the MPC exceedance is observed for four parameters (coloration, turbidity, iron, sulphides).

A. A. Ivanov, Cand. Chem. Sc.

(signature)

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EXPERT CONCLUSION

ON PROSPECTS OF THE USE OF USVR MATERIAL FOR THE PURIFICATION OF POTABLE WATER (TAP WATER, WELL WATER AND ARTESIAN WELL WATER)

THE EXPERIMENTAL FILTER SPECIMEN USED IN THE TESTS, IN WHICH A NEW **USVR** SORBENT HAS BEEN USED AS A FILTRATION ELEMENT (FILTER LAYER THICKNESS IS 8 CM) HAS SHOWN A HIGH EFFECTIVENESS BY THE MAJORITY OF MOST IMPORTANT PARAMETERS FOR POTABLE (TAP, WELL ARTESIAN WELL) WATER TO BE REGULATED BY **SANPIN**. FOR SOME PARAMETERS, THE METHOD OF ADDITIVES HAS BEEN USED (DILUTION OF COMPONENTS FROM **SSS**). THE RESULTS OF TESTS ARE GIVEN IN QCA REPORTS NOS. 2116, 2117 AND 2118 DATED 10TH FEBRUARY 2000.

THE **USVR** MATERIAL BY RESULTS OF THE TESTS HAS SHOWN ITSELF AS A HIGH-EFFECTIVE UNIVERSAL SORBENT FOR MOST OF THE PARAMETERS TO BE REGULATED BY **SANPIN**; AT THAT ALL THREE TYPES OF FILTERED TYPES OF WATER (TAP, WELL AND ARTESIAN WATER) AFTER FILTRATION MEET THE **SANPIN** REQUIREMENTS 2.1.4.559-96 FOR POTABLE WATER.

FILTERS BASED ON THIS SORBENT (**USVR**) CAN BE RECOMMENDED FOR HIGH-EFFECTIVE PURIFICATION OF TAP WATER, WELL AND ARTESIAN WELL WATER.

HEAD OF THE CENTRE *(signature)* O. A. SHPIGOUN
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EXPERT CONCLUSION

UPON RESULTS OF RESOURCE TESTS OF FILTER MODELS BASED ON THE USVR MATERIAL FOR THE PURIFICATION OF POTABLE WATER

UPON RESULTS OF OUR PREVIOUS INVESTIGATIONS, THE **USVR** MATERIAL HAS SHOWN ITSELF AS S FILTRATION AGENT FOR THE PURIFICATION OF POTABLE WATER FROM ORGANIC AND METAL-ORGANIC CHEMICAL COMPOUNDS (FOR EXAMPLE, IRON HUMATES) BEING INCLUDED INTO THE **SANPIN** LIST. ON THIS BASIS, THE TESTING PARAMETERS HAVE BEEN CHOSEN AT THE CONDUCTION OF RESOURCE TESTS.

THE FILTER MODEL TESTED HAS DEMONSTRATED PRACTICALLY UNCHANGED HIGH DEGREE AT PASSING OF 200 L OF WATER BY CHLOROFORM, IRON, NITROGEN AMMONIUM AND SUM OF ORGANIC SUBSTANCES.

FOR RESOURCE TESTS, TAP WATER HAS BEEN USED WITH ADDITIVES OF CHLOROFORM AND COPPER (REPORT NO. 2174) AND REAL TAP WATER OF THE TOWN OF RAMENSKOYE (REPORT NO. 2175).

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EXPERT CONCLUSION

UPON RESULTS OF RESOURCE TESTS OF FILTER MODELS BASED ON THE USVR MATERIAL WITH ADDITIVES OF AERATING AGENTS AND CATION-EXCHANGERS FOR THE PURIFICATION OF POTABLE WATER

UPON RESULTS OF OUR PREVIOUS INVESTIGATIONS, THE **USVR** MATERIAL HAS SHOWN ITSELF AS S FILTRATION AGENT FOR THE PURIFICATION OF POTABLE WATER FROM ORGANIC AND METAL-ORGANIC CHEMICAL COMPOUNDS (FOR EXAMPLE, IRON HUMATES) BEING INCLUDED INTO THE **SANPIN** LIST. IN ORDER TO WIDEN THE SPECTRUM OF ECOTOXICANTS BEING ABSORBED BY THE FILTER AND INCREASE ITS RESOURCE, THE ADDITIVES OF AERATING AGENTS AND CATION-EXCHANGERS HAVE BEEN INTRODUCED. ON THIS BASIS, THE TESTING PARAMETERS HAVE BEEN CHOSEN AT THE CONDUCTION OF RESOURCE TESTS.

THE FILTER MODEL TESTED HAS DEMONSTRATED PRACTICALLY UNCHANGED HIGH DEGREE AT PASSING OF 500 L OF WATER BY CHLOROFORM, IRON, NITROGEN AMMONIUM, SUM OF ORGANIC SUBSTANCES, COPPER AND SULPHIDE.

FOR RESOURCE TESTS, TAP WATER HAS BEEN USED WITH ADDITIVES OF CHLOROFORM AND COPPER (REPORT NO. 2174) AND REAL TAP WATER OF THE TOWN OF RAMENSKOYE (REPORTS NOS. 2175, 2210-2216).

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EXPERT CONCLUSION

upon results of analysis of natural potable water in the area of the Baikonur space-vehicle launching site

ON THE BASIS OF CONDUCTED CHEMICAL ANALYSES OF THE COMPOSITION OF NATURAL POTABLE WATER IN THE AREA OF THE BAIKONUR SPACE-VEHICLE LAUNCHING SITE (THE QUANTITATIVE CHEMICAL ANALYSIS REPORTS ARE ATTACHED), A CONCLUSION CAN BE MADE THAT THIS WATER CONTAIN A NUMBER OF COMPONENTS IN SUCH CONCENTRATIONS, WHICH MAKE THEM UNSAFE FOR HUMAN HEALTH AT THE USE AS POTABLE WATER.

THE INVESTIGATIONS CONDUCTED HAVE SHOWN THAT IT IS POSSIBLE TO CHOSE FILTRATION ELEMENTS IN CARTRIDGES OF DOMESTIC FILTER OF THE "BARRIER" TYPE FOR A COMPLETE NORMALISATION OF WATER PARAMETERS OVER ALL PARAMETERS BEING NORMALISED. SO AFTER PASSING OF INITIAL WATER THROUGH A COMBINED FILTER FROM A NEW SORBING MATERIAL – **USVR**, THE COMBINATIONS OF CATION-EXCHANGER AND ANION-EXCHANGER IN THE POTASSIUM, SODIUM AND CHLORINE FORMS, WATER IS IN FULL COMPLIANCE WITH ALL REGULATORY DOCUMENTS FOR POTABLE WATER ESTABLISHED BY **SANPIN** OF THE RUSSIAN FEDERATION. BASING ON THESE FILTRATION ELEMENTS, ONE CAN ALSO MANUFACTURE MORE POWERFUL INDUSTRIAL HIGH-PERFORMANCE FILTERS.

IN ADDITION, USING THIS RE-GENERANT IN THE POTASSIUM-SODIUM FORM, WE MANAGED, PARALLEL WITH SOLUTION OF MAIN PROBLEMS OF PURIFICATION OF THIS WATER, TO DECREASE THE SODIUM CONTENT IN WATER REDUCING IT THE ESTABLISHED STANDARD PARAMETER VALUES. IT MEANS THAT THIS FILTER CAN BE RECOMMENDED FOR THE PURIFICATION OF BOTH NORMAL AND HARD WATER IN DOMESTIC (HOUSEHOLD) CONDITIONS; AT THAT THE SODIUM CONTENT IN WATER REMAIN WITHIN THE PERMISSIBLE STANDARD LIMITS.

IT HAS BEEN ESTABLISHED THAT THE TOTAL MICROBE NUMBER IN THE RIVER WATER EXCEEDS THE REGULATORY PARAMETERS; HOWEVER NO PATHOGENIC MICROBES HAVE BEEN DETECTED IN THEM. THE PROBLEM OF REDUCTION OF THE TOTAL NUMBER UP TO THE STANDARD VALUE CAN BE EASILY SOLVED BOTH IN INDUSTRIAL AND IN DOMESTIC CONDITIONS BY WELL-ELABORATED STANDARD METHODS. SO THE INSTALLATION OF A PRELIMINARY FILTER FROM ANION-EXCHANGING ION-CONTAINING RESINS REDUCES THE TOTAL MICROBE NUMBER TO THE STANDARD VALUE; IN THIS CASE THE OUTLET WATER AFTER THE FILTER DOES NOT CONTAIN FREE IODINE.

HEAD OF THE CENTRE,
DOCTOR OF CHEMICAL SCIENCES, PROFESSOR *(signature)* O. A. SHPIGOUN

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QCA Report No. 2216 dated 03.04.2000

1. Name of object: Water.

2. Customer: Scientific & Research Institute on Physics of Fullerenes.

3. Sample code: Initial.

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	4.3 mg O_2/l	Titr.	5.0
2.	Ammonium	2.8	s/f	2.5
3.	Copper	1.6	AAS	0.1
4.	Sulphide	0.18	s/f	0.003
5.				
6.				
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10.				

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QCA Report No. 2118 dated 10.02.2000

1. Name of object: Water.

2. Customer: Rasskazovka.

3. Sample code: Well.

4. Sample delivery date: 09.02.2000.

5. Analysis conduction date: 10.02.2000.

6. Sample preparation.

No.	Components to be determined	Initial QCA results, mg/l	After filter QCA results, mg/l	Note MPC, mg/l
1.	Hardness	5.6	5.4	6-8
2.	Nitrites	21.0	15.8	45
3.	Sulphites	56	44	500
4.	Sulphides	0.004	0.001	0.003
5.	Nitrogen ammonium	2.7	0.48	2.5
6.	Coloration, degrees	10	1.8	20
7.	Turbidity, EMF	1.25	0.06	2.6
8.	Suspended substances	10	1.0	15
9.	Permanganate oxidability	3.2	1.0	5.0
10.	Fluorides	0.29	0.05	1.5
11	Phosphates	0.80	0.31	3.5
12.	Manganese	Not detected	Not detected	0.1
13.	Iron gen.	5.21	0.01	0.3
14.	Iron organic. (humus)	0.28	Not detected	
15.	Copper	0.01	Not detected	1.0
16.	Aluminium	0.03	Not detected	0.5
17.	Lead	Not detected	Not detected	0.03
18.	Zinc	Not detected	Not detected	5.0
19.	Chlorine residuals free	Not detected	Not detected	0.3-0.5
20.	Mineralisation	340	250	1000
21.	Chlorides	17.5	16.6	350
22.	Molybdenum	–	–	0.25

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Address: Chemistry Department, Building 3,
1 Moscow University, Leninskiye Gory, GSP-5,
Moscow, 119899, Russia. Tel.: 939-13-82, 939-52-60.

QCA Report No. 2117 dated 10.02.2000

1. Name of object: Water.

2. Customer: Town of Orekhovo-Zuyevo.

3. Sample code: Well.

4. Sample delivery date: 09.02.2000.

5. Analysis conduction date: 10.02.2000.

6. Sample preparation.

No.	Components to be determined	Initial QCA results, mg/l	After filter QCA results, mg/l	Note MPC, mg/l
1.	Hardness	4.68	4.00	6-8
2.	Nitrites	1.1	0.8	45
3.	Sulphites	1.5	Not detected	500
4.	Sulphides	0.001	Not detected	0.003
5.	Nitrogen ammonium	Not detected	Not detected	2.5
6.	Coloration, degrees	8	1.5	20
7.	Turbidity, EMF	0.6	0.02	2.6
8.	Suspended substances	1.0	0.1	15
9.	Permanganate oxidability	1.2	0.5	5.0
10.	Fluorides	0.2	Not detected	1.5
11	Phosphates	Not detected	Not detected	3.5
12.	Manganese	0.03	0.01	0.1
13.	Iron gen.	0.7	Not detected	0.3
14.	Iron organic. (humus)	Not detected	Not detected	
15.	Copper	Not detected	Not detected	1.0
16.	Aluminium	Not detected	Not detected	0.5
17.	Lead	Not detected	Not detected	0.03
18.	Zinc	0.17	0.05	5.0
19.	Chlorine residuals free	0.06	Not detected	0.3-0.5
20.	Mineralisation	210	170	1000
21.	Chlorides	2.9	2.7	350
22.	Molybdenum	–	–	0.25

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Professor

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QCA Report No. 2116 dated 10.02.2000

1. Name of object: Water.

2. Customer: Town of Ramenskoye. ZAO Medved k.

3. Sample code: Water pipeline.

4. Sample delivery date: 09.02.2000.

5. Analysis conduction date: 10.02.2000.

6. Sample preparation.

No.	Components to be determined	Initial QCA results, mg/l	After filter QCA results, mg/l	Note MPC, mg/l
1.	Hardness	5.58	5.28	6-8
2.	Nitrites	2.5	2.0	45.0
3.	Sulphites	30	20	500
4.	Sulphides	0.008	0.002	0.003
5.	Nitrogen ammonium	4.4	0.83	2.5
6.	Coloration, degrees	28	4.0	20
7.	Turbidity, EMF	117	2.0	2.6
8.	Suspended substances	79	3.0	15
9.	Permanganate oxidability	3.4	2.0	5.0
10.	Fluorides	1.03	0.87	1.5
11	Phosphates	0.14	0.08	3.5
12.	Manganese	0.070	0.012	0.1
13.	Iron gen.	8.75	0.01	0.3
14.	Iron organic. (humus)	1.36	0.03	
15.	Copper	0.04	Not detected	1.0
16.	Aluminium	2.3	0.48	0.5
17.	Lead	0.011	0.007	0.03
18.	Zinc	Not detected	Not detected	5.0
19.	Chlorine residuals free	3.00	0.03	0.3-0.5
20.	Mineralisation	350	260	1000
21.	Chloride	6.8	6.5	350
22.	Molybdenum	3.5	0.7	0.25

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QCA Report No. 2165 dated 28.02.2000

1. Name of object: Water.

2. Customer: Scientific & Research Institute on Physics of Fullerenes

3. Sample code: After USVR filter.

4. Sample delivery date: 25.02.2000.

5. Analysis conduction date: 27.02.2000.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	pH	7.56	Potent.	
2.	Phenols	< 0.01	Chromat.	
3.	Oil products	0.05	IR	
4.	Benzopyren	< 0.005 μg/l	Chromat.	
5.	Hydroquinone	0.5	Chromat.	
6.	Phenol-carboxylic acid	11	Chromat.	
7.				
8.				
9.				
10.				

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QCA Report No. 2215 dated 03.04.2000

1. Name of object: Water passed through filter. USVR: cation-exchanger = 10:1.

2. Customer:

3. Sample code: Scientific & Research Institute on Physics of Fullerenes

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation. 500 l

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	0.5 mg O_2/l	Titr.	5.0
2.	Ammonite	0.15	s/f	2.5
3.	Copper	0.001	AAS	0.1
4.	Sulphide	0.002	s/f	0.003
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At the transfer from 450 l to 500 l, the water feed rate gas decreased approximately by one-third, but it still remained not less than 4 l/hour.

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QCA Report No. 2214 dated 03.04.2000

1. Name of object: Water passed through filter. USVR: cation-exchanger = 10:1.

2. Customer:

3. Sample code: Scientific & Research Institute on Physics of Fullerenes

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation. 450 l

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	0.3 mg O_2/l	Titr.	5.0
2.	Ammonite	0.12	s/f	2.5
3.	Copper	0.001	AAS	0.1
4.	Sulphide	0.002	s/f	0.003
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8.				
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QCA Report No. 2213 dated 03.04.2000

1. Name of object: Water passed through filter. USVR: cation-exchanger = 10:1.

2. Customer:

3. Sample code: Scientific & Research Institute on Physics of Fullerenes

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation. 400 l

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	0.3 mg O_2/l	Titr.	5.0
2.	Ammonite	0.12	s/f	2.5
3.	Copper	0.001	AAS	0.1
4.	Sulphide	0.001	s/f	0.003
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QCA Report No. 2212 dated 03.04.2000

1. Name of object: Water passed through filter. USVR: cation-exchanger = 10:1.

2. Customer:

3. Sample code: Scientific & Research Institute on Physics of Fullerenes

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation. 300 l

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	0.3 mg O_2/l	Titr.	5.0
2.	Ammonite	0.11	s/f	2.5
3.	Copper	0.001	AAS	0.1
4.	Sulphide	0.001	s/f	0.003
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6.				
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8.				
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QCA Report No. 2211 dated 03.04.2000

1. Name of object: Water passed through filter. USVR: cation-exchanger = 10:1.

2. Customer:

3. Sample code: Scientific & Research Institute on Physics of Fullerenes

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation. 200 l

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	0.3 mg O_2/l	Titr.	5.0
2.	Ammonite	0.11	s/f	2.5
3.	Copper	0.001	AAS	0.1
4.	Sulphide	0.001	s/f	0.003
5.				
6.				
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8.				
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10.				

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QCA Report No. 2210 dated 03.04.2000

1. Name of object: Water passed through filter. USVR: cation-exchanger = 10:1.

2. Customer:

3. Sample code: Scientific & Research Institute on Physics of Fullerenes

4. Sample delivery date: 24.03.2000.

5. Analysis conduction date: 31.03.2000.

6. Sample preparation. 100 l

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note MPC, mg/l
1.	Permanganate oxidability	0.3 mg O_2/l	Titr.	5.0
2.	Ammonite	0.11	s/f	2.5
3.	Copper	0.001	AAS	0.1
4.	Sulphide	0.001	s/f	0.003
5.				
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QCA Report No. 2175 dated 13.03.2000

1. Name of object: Water – initial and after passing through filter.

2. Customer:

3. Sample code:

4. Sample delivery date:

5. Analysis conduction date: 9, 10.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results			4	Note
		1	2	3		
1.	Initial, 0 l	1.06	0.59	1.48	4.4	
2.	After filter, 1 l	0.08	0.30	0.73	1.8	
3.	After filter, 20 l	0.08	0.30	0.73	1.8	
4.	After filter, 40 l	0.08	0.30	0.75	1.8	
5.	After filter, 50 l	0.08	0.30	0.75	1.8	
6.	After filter, 100 l	0.09	0.30	0.78	1.9	
7.	After filter, 150 l	0.09	0.31	0.8	1.9	
8.	After filter, 200 l	0.09	0.33	0.96	2.0	
9.	After filter, 250 l	0.1	0.37	1.12	2.0	
10.						

1 – Iron gen., mg/l
2 – Nitrogen ammonium, mg/l
3 – Copper gen., mg/l
4 – Permanganate oxidability, mg O_2/l

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QCA Report No. 2174 dated 13.03.2000

1. Name of object: Water – initial and after passing through filter.

2. Customer:

3. Sample code:

4. Sample delivery date:

5. Analysis conduction date: 9, 10.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results			Method of analysis	Note
		1	2	3		
1.	Initial, 0 l	0.5	2.55	2.4		
2.	After filter, 1 l	n/d	1.06	1.3		
3.	After filter, 20 l	n/d	1.06	1.3		
4.	After filter, 40 l	n/d	1.06	1.3		
5.	After filter, 50 l	n/d	1.08	1.3		
6.	After filter, 100 l	n/d	1.1	1.4		
7.	After filter, 150 l	n/d	1.1	1.4		
8.	After filter, 200 l	<0.05	1.13	1.5		
9.	After filter, 250 l	0.06	1.28	1.5		
10.						

1 – Chloroform, mg/l
2 – Non-organic copper, mg/l
3 – Permanganate oxidability, mg O_2/l

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QCA Report No. 2166 dated 28.02.2000

1. Name of object: Waste water of OAO Nefteprodukt.

2. Customer: Scientific & Research Institute on Physics of Fullerenes

3. Sample code: Before filter.

4. Sample delivery date: 25.02.2000.

5. Analysis conduction date: 27.02.2000.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	pH	7.05	Potent.	
2.	Phenols	0.11	Chromat.	
3.	Oil products	86.6	IR	
4.	Benzopyren	0.8 mg/l	Chromat.	
5.	Hydroquinone	2.5	Chromat.	
6.	Phenol-carboxylic acid	63	Chromat.	
7.				
8.				
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10.				

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QCA Report No. 1919 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 4 – Tarakanovka river.

4. Sample delivery date: 09.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.780	IR	Before
2.	Permanganate oxidability	12.1 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.050	IR	After
5.	Permanganate oxidability	5.6 mg O_2/l	Titr.	filter
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20.				

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QCA Report No. 1918 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 3 – Chura river.

4. Sample delivery date: 09.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.400	IR	Before
2.	Permanganate oxidability	7.8 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.041	IR	After
5.	Permanganate oxidability	4.2 mg O_2/l	Titr.	filter
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Certification Testing & Analysis Centre (CTAC).
Chemical Department.

Executed by: A. A. Ivanov, Cand. Chem. Sc.

MOSCOW STATE UNIVERSITY

NAMED AFTER M. V. LOMONOSOV

CERTIFICATION TESTING & ANALYSIS CENTRE

**(Certificate of Accreditation No. POCC RU.0001.511201,
License of State Ecology Committee of the Russian Federation:
G-187815, Reg. No. 98/0092/021/L)**

**Address: Chemistry Department, Building 3,
1 Moscow University, Leninskiye Gory, GSP-5,
Moscow, 119899, Russia. Tel.: 939-13-82, 939-52-60.**

QCA Report No. 1917 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 2 – Nishchenka river.

4. Sample delivery date: 09.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.340	IR	Before
2.	Permanganate oxidability	6.8 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.035	IR	After
5.	Permanganate oxidability	4.2 mg O_2/l	Titr.	filter
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Head of the Centre *(signature)* **O. A. Shpigoun**
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QCA Report No. 1916 dated 15.12.1999

1. Name of object: water.

2. Customer:

3. Sample code: No. 1 – Maryinskiy Park.

4. Sample delivery date: 14.12.1999.

5. Analysis conduction date: 14.12.1999.

6. Sample preparation.

No.	Components to be determined	QCA results, mg/l	Method of analysis	Note
1.	Floating oil products	0.120	IR	Before
2.	Permanganate oxidability	5.1 mg O_2/l	Titr.	filter
3.				
4.	Floating oil products	0.010	IR	After
5.	Permanganate oxidability	2.6 mg O_2/l	Titr.	filter
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1	2	3	4	5	6	7
13	Phosphorus general	58.2	39.0	2.3		25
14	COD (g O_2/l)	20.8	13.44	10.4	15	2
15	PO	644	452	338	5	2
16	BOD(mg O_2/l)	5.1	3.4	2.5	3.0	2
17	Carbon general (g/l)	7.6	4.0	3.7		2
18	Solid residual (g/l)	4.8	5.5	6.2		
19	Hardness general	5.08	11.9	10.52	7.0	
20	Calcium	3.2/64.0	5.84/116.8	5.94/118.8	200	1
21	Magnesium	1.88/22.8	6.06/73.6	4.58/56.7		
22	Sulphites	670	580	650	500	
23	Chlorides	1800	1880	1700	350	
24	pH (units)	7.25	6.91	7.54		

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Address: Chemistry Department, Building 3, 1 Moscow University, Leninskiye Gory, GSP-5, Moscow, 119899, Russia. Tel.: 939-13-82, 939-52-60.

QCA Report No. 2180 dated 17.03.2000

1. Name of object: water.

2. Customer:

3. Sample code: model solution.

4. Sample delivery date: 16.03.2000.

5. Analysis conduction date: 16.03.2000.

6. Sample preparation.

No.	Components to be determined	QCA results			Method of analysis	Note
		1	2	3		
1.	Lead, mg/l	1.14	0.0014	950^{x}	AAS	
2.	Cadmium, mg/l	1.66	< 0.0005	$> 2000^{x}$	– " –	
3.	Zinc, mg/l	158.3	< 0.005	$> 30000^{x}$	– " –	
4.	Copper, mg/l	13.2	0.01	1320^{x}	– " –	
5.	Iron gen., mg/l	1.1	0.013	$\sim 100^{x}$	– " –	
6.	Nitrogen ammonium, mg/l	0.22	0.03	$\sim 8^{x}$	s/f	
7.						
8.						
9.						
10.						

1 – Initial sample.

2 – After mixed filter USVR-cationite.

3. – Purification multiplicity.

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Executed by: K. A. Lushov
I. A. Ananieva

THE MOST OPTIMAL AND EXPEDIENT WOULD BE THE USE OF A SIMILAR FILTER BASED ON **USVR** EITHER ON FINAL PURIFICATION PHASES, AFTER PRELIMINARY FILTRATION BY STANDARD SEDIMENTATION FILTERS, OR THE CONDUCTION OF A FULL FILTRATION BY MEANS OF **USVR** USING A CONSECUTIVE SERIES OF 5-6 IDENTICAL FILTERS FILLED WITH THIS SORBENT ONLY.

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EXPERT CONCLUSION

ON PROSPECTS OF APPLICATION OF **USVR** MATERIAL FOR PURIFICATION OF DOMESTIC AND INDUSTRIAL EFFLUENTS

THE MATERIAL (**USVR**) USED AT TESTS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS HAS SHOWN HIGH RESULTS, BOTH BY ANION SORPTION AND BY CATION SORPTION.

THE TESTS CONDUCTED AND THE RESULTS OF CHEMICAL ANALYSES HAVE SHOWN THAT THIS SORBENT HAS EXCELLENT SORPTION PROPERTIES FOR A WHOLE NUMBER OF ORGANIC AND NON-ORGANIC CHEMICAL COMPOUNDS, FOR EXAMPLE, IT ABSORBS (AT RELATIVELY SMALL FILTER THICKNESS OF ABOUT 10 CM) OIL PRODUCTS AND ETHER-SOLUBLE SUBSTANCES FROM SOLUTIONS UP TO THE LEVELS BEING BELOW MAXIMAL PERMISSIBLE CONCENTRATIONS (THE PURIFICATION MULTIPLICITY IS OVER 1000). THE MATERIAL HAS ALSO DEMONSTRATED HIGH SORPTION EFFECTIVENESS FOR MANY CATIONS, INCLUDING COPPER (30 TIMES), CHROME (+6) (FIVE TIMES), IRON (THREE TIMES), AMMONIA (TWO-THREE TIMES), VANADIUM (FIVE TIMES), MANGANESE (TWO TIMES), SUCH ORGANIC AND NON-ORGANIC ANIONS AS SULPHIDES (SIX TIMES), PHOSPHATES (35 TIMES), FLUORIDES (FIVE TIMES), NITRITES (THREE TIMES). IN ADDITION, THIS MATERIAL EXCELLENTLY FUNCTIONS AS A SEDIMENTATION FILTER – THE CONCENTRATION OF SUSPENDED PARTICLES DECREASES MORE THAN BY ONE HUNDRED TIMES.

IT SHOULD BE SPECIALLY NOTED THAT ONLY A VERY FEW INTEGRATED INDUSTRIAL FILTRATION SETS (CONSISTING OF THREE AND MORE DIFFERENT FILTERS) HAVE SUCH UNIVERSAL ABILITY TO SIMULTANEOUSLY PURIFY WASTE WATERS FROM ANIONS, CATIONS AND ORGANIC SUBSTANCES. IN ADDITION, A DISTINCTIVE PECULIARITY OF **USVR** IS THE EASINESS AND RELIABILITY OF ITS PRODUCTION TECHNOLOGY AND ITS LOW COST.

BESIDES UNIVERSALITY BY THE SPECTRUM OF SORBED CHEMICAL COMPONENTS, THIS MATERIAL HAS ONE MORE UNIQUE PROPERTY: AFTER PASSING OF A SOLUTION THROUGH A LAYER OF THIS SORBENT WITH THE THICKNESS OF ABOUT **10-15** CM, SUCH IMPORTANT PARAMETER AS BIOLOGICAL OXYGEN DEMAND (**BOD5**) DECREASES ALMOST TWICE. ONLY SPECIAL BACTERIAL FILTERS (FOR EXAMPLE, PENTA PURE MANUFACTURED IN USA, THE COST OF A LOW-CAPACITY INDUSTRIAL VERSION OF WHICH WITH THE FLOWING CAPACITY OF 2 L/MIN EQUALS TO ABOUT ONE THOUSAND US DOLLARS) ARE CAPABLE TO ACT IN A SIMILAR MANNER.

IN OUR OPINION, THE **USVR** SORBENT, WHICH WE HAVE TESTED, HAS GOOD PROSPECTS; IT CAN IDENTICALLY EFFECTIVELY FUNCTION AS A MONOMATERIAL WITH A UNIQUE BROAD SPECTRUM OF SORBED CHEMICAL COMPOUNDS FOR THE INTEGRATED PURIFICATION OF INDUSTRIAL EFFLUENTS; IN ADDITION, IT IS CAPABLE TO ABSORB TOXIC SUBSTANCES DIRECTLY FROM A VAPOUR OR CONDENSATE. THE MATERIAL CAN ALSO WORK WELL IN A VAPOUR WITH BELTING FILTERS FOR PRELIMINARY PURIFICATION AND IN A VAPOUR WITH SPECIAL CERAMICS – FOR FINAL PURIFICATION.