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DETERMINATION AND IMPLEMENTATION OF THE CONTENT OF AN UNKNOWN SUBSTANCE IN THE COMPLETION PARTS “TANK” OF VEHICLES.

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Abstract: In this paper, we explained the taken experiments on an unknown substance in tank. While determination and implementation we analyzed several substances which were found in antifreeze of vehicles. In conclusion, we took every and each results into consideration and concluded analyzed experiment test results.

Key words: Vehicles, tank, radiator, chemical substance, experiment, flus.

1. INTRODUCTION

Improvements in cooling system efficiency are required in modern internal combustion engines (ICE). Optimal thermal management presents several advantages in terms of lower pump mechanical power, reduced friction losses and shorter warm-up time, which result in reduced fuel consumptions and CO^2 emissions. These goals can be achieved by adopting lower coolant flow rates, which give rise to nucleate boiling regime. The key requirement for a precision cooling strategy is the capability of developing a reliable, model-based control of the cooling regime. This paper presents an original model of the engine cooling system, which is able to detect dynamically the occurrence and the extent of the nucleate boiling phenomenon as well as to calculate the spatial-averaged metal temperature and the engine-out coolant temperature. The model, therefore, makes it possible to run specific control algorithms for managing the cooling process, based on simple on-board transducers. Both the actual wall-to-coolant heat flux and the minimum required heat flux that will produce the on-set of the nucleate boiling are computed and the distance from the two heat fluxes is a useful index for the control strategy. For instance, during engine warm-up, the controller would set the coolant flow rate in order to keep the lowest possible heat transfer coefficient under single-phase flow regime; this guarantees a quicker rise of the engine wall temperature. On the contrary, under fully warmed conditions, based on model predictions, the controller would regulate the coolant flow rate, in order to operate under nucleate boiling conditions and to obtain, as a consequence, the highest possible heat transfer coefficient; this guarantees that only a limited fraction of the wall is subjected to nucleate boiling, thus preserving engine reliability. This work also provides an original and significant contribution to the knowledge of the heat transfer in internal combustion engines and allows the estimation of other key parameters, which cannot be measured directly. Input data needed are engine-in coolant temperature and pressure, coolant mass flow rate, fuel mass flow rate and engine speed.

2. MAIN PART

This specification details the materials and performance requirements of an engine coolant capable of satisfactory performance throughout an extended working life when used at recommended concentrations. The extended life engine coolant is used to protect automotive engine cooling systems from corrosion, freezing and boil over. The extended life engine coolant concentrate is intended to be mixed with clean, potable water having the quality found in most parts of North America and at concentrations recommended in the vehicle owner's manual.

In determining the cause of sedimentation in the radiator, it was assumed that the components that are most likely to form sediment are a mixture of antifreeze (red) and ALF-1224 Flux used in the bonding process. First of all, the antifreeze solution was analyzed by the element in the Rigaku NEX CG EDXRF Analyzer with Polarization. The results are shown in Figure 1.

Analyzed result(FP method)

No.	Component	Result	Unit	Stat. Err.	LLD	LLQ
1	Cl	0.0077	mass%	0.0001	0.0002	0.0005
2	Al2O3	42.3	mass%	0.0477	0.0073	0.0220
3	SO3	0.0168	mass%	0.0004	0.0003	0.0009
4	K2O	57.1	mass%	0.0555	0.0038	0.0113
5	CaO	(0.208)	mass%	0.0310	0.0872	0.262
6	Fe2O3	0.0166	mass%	0.0010	0.0014	0.0043
7	CuO	0.0038	mass%	0.0003	0.0004	0.0012
8	Ga2O3	0.0171	mass%	0.0004	0.0003	0.0008
9	As2O3	0.0013	mass%	<0.0001	0.0002	0.0005
10	Rb2O	0.0051	mass%	0.0001	0.0001	0.0003
11	Y2O3	0.0009	mass%	<0.0001	0.0002	0.0007
12	ZrO2	0.290	mass%	0.0031	0.0007	0.0021
13	Ag2O	0.0009	mass%	0.0002	0.0003	0.0009
14	TeO2	(0.0027)	mass%	0.0004	0.0009	0.0027
15	Tb4O7	0.0132	mass%	0.0017	0.0039	0.0118

Spectrum

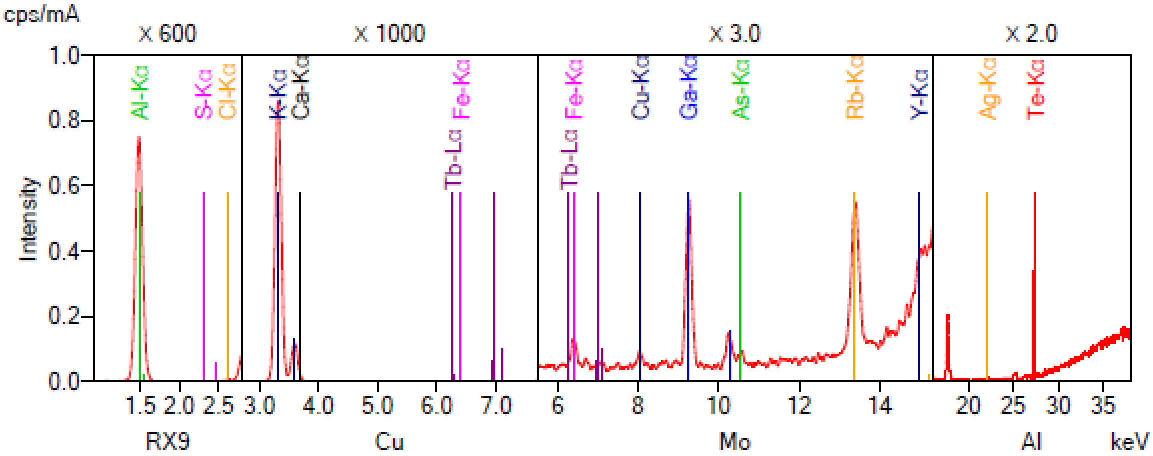

Figure: 1. *Analysys the ALF-1224 Flux in powder form in the Rigaku NEX CG EDXRF Analyzer with Polarization.*

As can be seen, the elements that may be involved in the formation of the main sediment here are aluminum, magnesium, silicon and calcium. The next step was to analyze the ALF-1224 Flux in powder form in the Rigaku NEX CG EDXRF Analyzer with Polarization. The results are shown in Figure 2.

Analyzed result(FP method)

No.	Component	Result	Unit	Stat. Err.	LLD	LLQ
1	Cl	0.0108	mass%	0.0002	0.0002	0.0007
2	Al	27.8	mass%	0.0306	0.0048	0.0144
3	S	0.0094	mass%	0.0002	0.0002	0.0005
4	K	71.5	mass%	0.0536	0.0047	0.0141
5	Ca	(0.281)	mass%	0.0394	0.110	0.331
6	Fe	0.0208	mass%	0.0012	0.0018	0.0054
7	Cu	0.0054	mass%	0.0004	0.0006	0.0017
8	Ga	0.0230	mass%	0.0005	0.0003	0.0010
9	As	0.0018	mass%	0.0001	0.0002	0.0007
10	Rb	0.0084	mass%	0.0002	0.0002	0.0005
11	Y	0.0013	mass%	0.0001	0.0003	0.0010
12	Zr	0.391	mass%	0.0042	0.0009	0.0028
13	Ag	0.0016	mass%	0.0003	0.0005	0.0015
14	Te	(0.0040)	mass%	0.0006	0.0013	0.0040
15	Tb	0.0202	mass%	0.0025	0.0060	0.0181

Spectrum

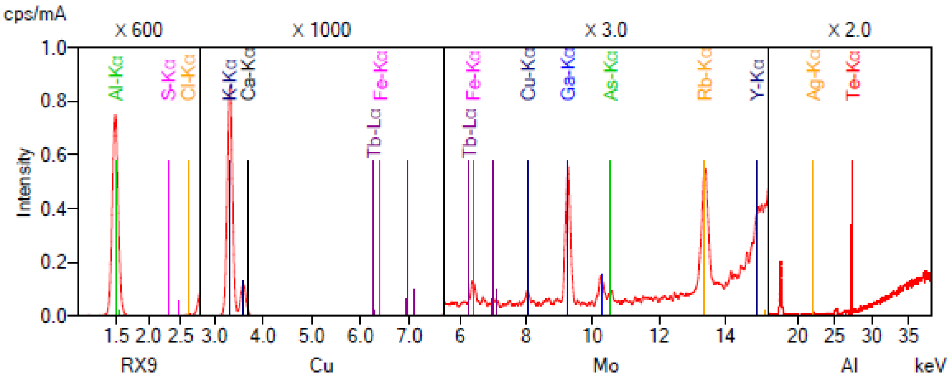

Figure: 2. Elements that involved in the formation of the main sediment here are aluminum and potassium

Analyzed result(FP method)

No.	Component	Result	Unit	Stat. Err.	LLD	LLQ
1	Total	885	mg/cm2			
2	Cl	126	ppm	1.93	1.89	5.66
3	H2O	98.6	mass%			
4	MgO	(11300)	ppm	3240	8820	26500
5	Al2O3	1870	ppm	155	233	699
6	SiO2	736	ppm	37.5	41.8	125
7	P2O5	42.7	ppm	5.68	10.3	30.8
8	SO3	182	ppm	5.63	4.35	13.1
9	CaO	146	ppm	5.74	7.11	21.3
10	TiO2	9.74	ppm	1.23	2.68	8.04
11	Cr2O3	3.61	ppm	0.415	0.885	2.65
12	Fe2O3	25.4	ppm	2.24	4.51	13.5
13	CuO	8.05	ppm	0.664	1.35	4.06
14	SrO	2.37	ppm	0.191	0.492	1.48
15	Nb2O5	(2.40)	ppm	0.534	1.18	3.55
16	Ag2O	6.01	ppm	0.630	1.12	3.36
17	SnO2	23.4	ppm	1.56	3.19	9.56
18	U3O8	(1.42)	ppm	0.331	0.925	2.78

Spectrum

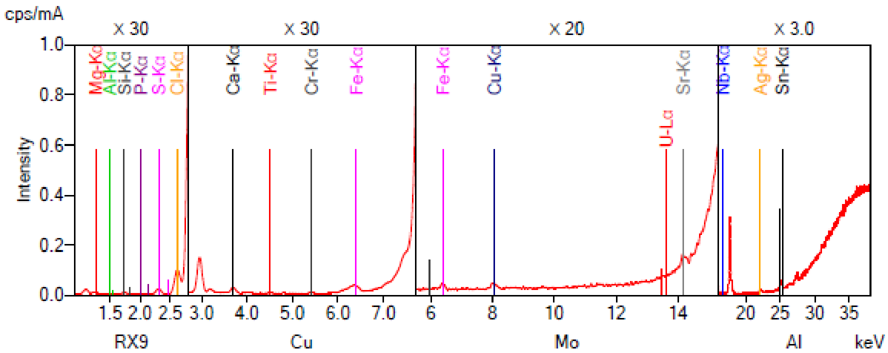

Figure: 3. Elements that involved in the formation of the main sediment here are silicon, calcium and potassium

As can be seen from the figure, the elements that may be involved in the formation of the main sediment here are aluminum and potassium. The next step was to analyze the element in the Rigaku NEX CG EDXRF Analyzer with Polarization device. The results obtained are shown in Figure 3. The main sediments here are aluminum-potassium, silicon, calcium and potassium. If we pay attention to the color of the sediment, it is gray, which in turn is due to the silicon (gray color), antifreeze, aluminum, calcium and potassium ions in the antifreeze. In order to increase the reliability of the data obtained, we prepared a mixture of antifreeze and ALF-1224 Flux as an artificial model mixture, resulting in a gray precipitate formed on the radiator. We tested it on an element in the Rigaku NEX CG EDXRF Analyzer with Polarization. The results are shown in Figure 4.

Analyzed result(FP method)

No.	Component	Result	Unit	Stat. Err.	LLD	LLQ
1	Total	885	mg/cm2			
2	Mg	(6810)	ppm	1950	5320	15900
3	Al	987	ppm	81.9	123	370
4	Si	344	ppm	17.5	19.5	58.5
5	P	18.6	ppm	2.48	4.48	13.4
6	S	72.9	ppm	2.25	1.74	5.22
7	Cl	126	ppm	1.93	1.89	5.66
8	Ca	104	ppm	4.10	5.08	15.2
9	Ti	5.84	ppm	0.737	1.60	4.81
10	Cr	2.47	ppm	0.284	0.605	1.81
11	Fe	17.7	ppm	1.56	3.15	9.46
12	Cu	6.43	ppm	0.530	1.08	3.24
13	Sr	2.00	ppm	0.161	0.416	1.25
14	Nb	(1.68)	ppm	0.373	0.828	2.49
15	Ag	5.61	ppm	0.587	1.04	3.13
16	Sn	18.5	ppm	1.23	2.51	7.54
17	U	(1.20)	ppm	0.281	0.784	2.35
18	H2O	99.1	mass%			

Spectrum

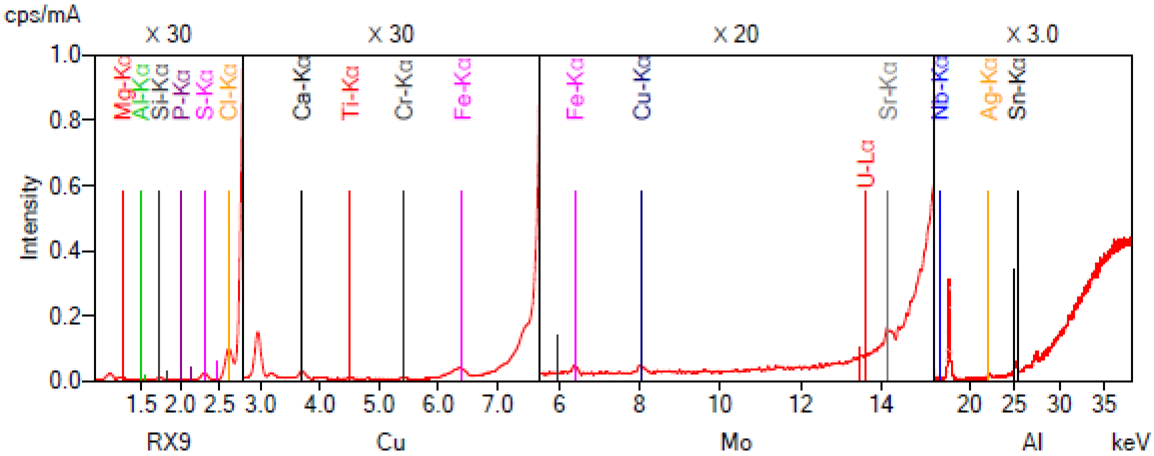

Figure: 4. Composition of our artificial model mixture is similar to that of the gray precipitate formed in the radiator, due to the presence of aluminum and silicon calcium as the main elements.

3. CONCLUSION

As can be seen from the results obtained, the composition of our artificial model mixture is similar to that of the gray precipitate formed in the radiator, due to the presence of aluminum and silicon calcium as the main elements. The amount of potassium is significantly higher due to the fact that in our model mixture we added ALF-1224 Flux directly to the antifreeze. The composition of the artificial model mixture with the sediment formed in the radiator was observed to be almost homogeneous. It can be said that the amount of ALF-1224 Flux solution left in the radiator during the radiator connection process, which eventually accumulated over time due to mixing with antifreeze, led to the formation of a gray precipitate.

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