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November 7, 1955

Mr. Warren R. Grimes
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MOUND DECLASSIFICATION REVIEW	
1ST REVIEW DATE: <u>3/4/98</u>	DETERMINATION (CIRCLE NUMBER(S))
AUTHORITY: <u>DAOC, DADC, DADD</u>	1. CLASSIFICATION RETAINED
NAME: <u>T.M. FLANNERY</u>	2. CLASSIFICATION CHANGED TO
2ND REVIEW DATE: <u>3/4/98</u>	3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: <u>DAOC, DADC, DADD</u>	4. COORDINATE WITH
NAME: <u>J.F. Eichelberger</u>	5. CLASSIFICATION CANCELLED
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY)

Dear Warren:

Enclosed are pages 6, 7, 8, 9 and 10 from the Monthly Technical Activities Report through October 15, 1955, Mound Laboratory Central Files Number 55-10-26.

In addition to the material from the Technical Activities Report we are including summaries of the work to date on differential thermal analysis, petrographic filtration, viscosity and density measurements.

As you will recall we are expecting to visit you November 15 and 16 to discuss the present status of the work and a discussion of the future work. At this stage it seems possible that the density and viscosity equipment could be used on a new ternary system such as the NaF-LiF-BeF₂ or the LiF-BeF₂-UF₄. The men working on the NaF-BeF₂-UF₄ phase diagram feel that there is still much to be done to finish their work. We have given some consideration to the idea of setting up more DTA and petrographic equipment so that runs could be started on the same ternary system which is to be investigated with the viscosity and density apparatus. Results from additional filtration equipment would be slow unless the analytical work could be speeded up.

We are looking forward to seeing you next week.

Very truly yours,

DISTRIBUTION:

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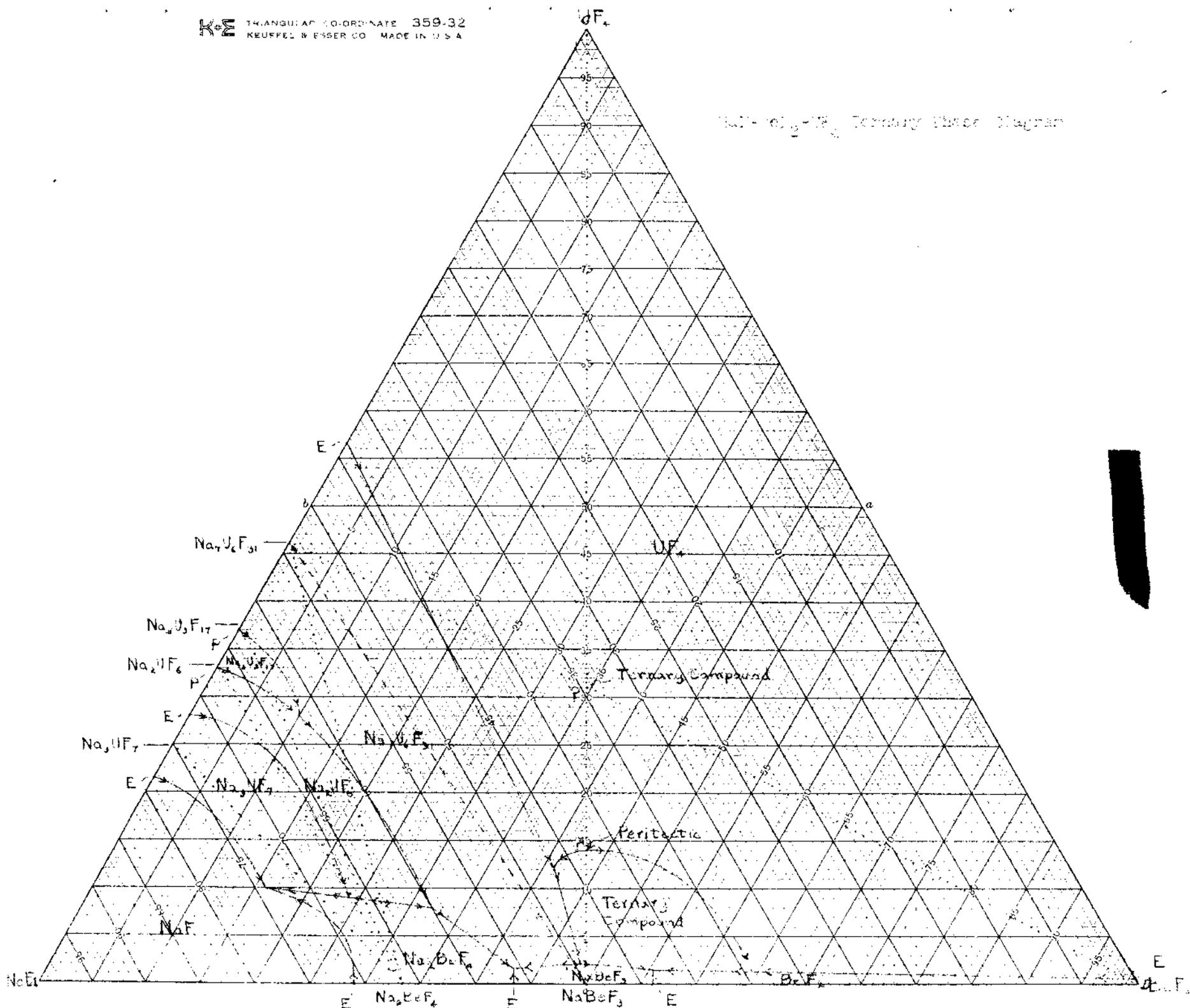
John
John F. Eichelberger

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*GROUP 1
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$\text{NaF}-\text{UF}_6-\text{BF}_3$ Ternary Phase Diagram



Progress Report on the NaF-BeF₂-UF₄ Ternary Phase Diagram

by

P. Tucker and B. Rhinehammer

In the preliminary investigation of the NaF-BeF₂-UF₄ ternary system all possibilities of quasi-binaries were investigated. Only one quasi-binary was established which is represented by the join between NaBeF₃ and Na₇U₆F₃₁. The location of the quasi eutectic has not been established definitely but is believed to exist very close to the compound, NaBeF₃.

The primary phase areas NaF, Na₃UF₇ and Na₂BeF₄ were found to form a ternary eutectic at the approximate composition as shown on the phase diagram. The eutectic temperature is 483°C ± 5°.

The primary phase areas Na₂BeF₄, Na₇U₆F₃₁ and NaBeF₃ were found to form a ternary eutectic at the approximate composition as shown on the phase diagram. The eutectic temperature, which is approximately 336°C, represents the lowest melting composition in the ternary diagram.

The primary phase areas NaBeF₃, ternary compound and BeF₂ are believed to form a ternary eutectic at the approximate composition as shown on the phase diagram. Difficulties in attaining equilibrium conditions with compositions in this area have made results inconclusive. However, the eutectic temperature at this point is known to be approximately 356°C.

The primary phase areas Na₂BeF₄, Na₃UF₇ and Na₂UF₆ were found to form a ternary peritectic at the approximate composition shown on the phase diagram. The peritectic temperature is approximately 527°C. The downward slope of the valley from the peritectic point to the NaF-Na₃UF₇-Na₂BeF₄ ternary eutectic has been established.

The primary phase areas Na_2BeF_4 , Na_2UF_6 and $\text{Na}_7\text{U}_6\text{F}_{31}$ are believed to form a ternary peritectic at a temperature of 500°C as shown on the phase diagram. The composition and peritectic temperature at this point are in doubt; however, petrographic results indicate the peritectic to be located to the right of the Na_2BeF_4 - $\text{Na}_7\text{U}_6\text{F}_{31}$ composition line.

In order to have two adjacent peritectics sloping in opposite directions as indicated on the phase diagram it is necessary that they be separated by a high point. This proposed point is indicated by the intersection of the peritectic valley with the Na_2BeF_4 - $\text{Na}_7\text{U}_6\text{F}_{31}$ composition line. The existence and location of this point are based on supposition and have not been proved.

The primary phase areas Na_2UF_6 , $\text{Na}_5\text{U}_3\text{F}_{17}$ and $\text{Na}_7\text{U}_6\text{F}_{31}$ are believed to form a ternary peritectic as shown on the phase diagram. The existence and composition of this peritectic are based upon supposition as no examinations have been made in this area.

Three probable ternary peritectics are believed to exist as shown on the phase diagram. These are shown by the intersection of the following phase areas: NaBeF_3 , $\text{Na}_7\text{U}_6\text{F}_{31}$ and ternary compound; $\text{Na}_7\text{U}_6\text{F}_{31}$, UF_4 and ternary compound; and BeF_2 , ternary compound and UF_4 . The existence of these peritectics is uncertain, and there is no conclusive evidence concerning their compositions or temperatures which is due largely to difficulties in obtaining equilibrium conditions for compositions in this area.

Investigations along the NaBeF_3 - UF_4 join have indicated the existence of an incongruent melting ternary compound, the composition of which is believed to lie on the join. Several unassigned thermal breaks have been found for compositions along this join. A strong break at 558°C is believed to be the peritectic temperature but has not been confirmed due to difficulties in attaining equilibrium conditions. If this peritectic temperature is correct the peritectic would occur



at approximately 14 mole percent UF_4 .

In plotting this ternary diagram the course of each primary phase boundary line was based upon limited information and may vary significantly from that shown on the phase diagram.

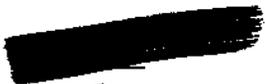


TABLE I

	Original Composition in Mole %			Temperature of Filtration (°C)	Analysis of Filtrate Mole %		
	UF ₄	BeF ₂	NaF		UF ₄	BeF ₂	NaF
1	12	15	73	492	11.9	15.8	72.3
2				520 527 539	7.8	20.3	71.9
3	5	20	75		7.4	22.6	70.0
4					6.4	24.7	68.9
5				540 552	4.8	26.2	69.0
6		27	71		3.2	26.5	70.3
7	2	30	68	550	4.1	26.7	69.2
8	5	28	67	534	8.1	25.7	66.2
9	7	27.5	65.5	528	8.7	24.6	66.7
10	12	20	68	530 520	9.4	25.1	65.5
11					9.4	22.2	68.4
12	20	40	40	574	16.3	44.0	39.7
13	30	35	35	606 700	20.2	42.4	37.4
14					28.7	35.5	35.8

Referring to the table, run #1 locates the ternary eutectic between NaF, Na₂BeF₄, and Na₃UF₇ which may be as low as 483°C as reported by DTA, although 492° is the lowest temperature tried in this work. Runs #2, thru #7 define the valley from this low eutectic point to the NaF-BeF₂ side of the phase diagram. Since all of these runs lie on a smooth curve although they are from three different starting compositions, the location of this valley appears to be reliable.

Runs #8, 9, and 10, which lie practically on top of each other although they are from three different starting compositions, could possibly locate the peritectic point where the phases Na₃UF₇, Na₂BeF₄, and Na₂UF₆ come together. Run #11, which has the same starting composition as #10 although its temperature of filtration is 10° below #10, has a liquidus to the left of #10. This fact appears to agree with the DTA work in this region which indicates the peritectic point just described flows back into the eutectic formed by NaF-Na₃UF₇-Na₂BeF₄.

Runs #12,13 and 14, which are made from starting compositions which lie on the line between UF₄ and NaBeF₃, give liquidus compositions which are also close to this line. The fact that they are not exactly on this line is probably due to the fact that the error in the analysis of BeF₂ is large in this area. These runs agree closely with temperature breaks found in DTA work which can now be identified as liquidus temperatures. The filtrations do not help to solve the problem of whether there is a ternary compound in this area, but it does show that if there is a ternary compound its composition must lie on the line between NaBeF₃ and UF₄ since all of the filtrations were close to this line.

Comments on Viscosity and Density Measurements

B. C. Blanke

The following data and graphs are summaries of measurements made during the past four months on viscosity and density of the ternary mixture; sodium fluoride, beryllium fluoride, uranium fluoride. The density values have been evaluated, weighted, and are essentially in their final form. The viscosity values have not been evaluated and should be considered as raw data until necessary reruns and correlations have been made. Any corrections found will be noted in the next report.

The area of the ternary studies was determined by engineering considerations. The liquidus temperature had to be lower than 650°C, and the viscosity less than 6 centipoise at 800°C.

The experimental data are reported completely for any one run, but for some mixtures when more than one run was made on identical samples, the reported runs were selected by consideration of slope, interpolations of values, and for reasons of experimental error. The values of density and viscosity were then interpolated at 600°C and 800°C for each mixture, and these values were used in the plotting of viscosity and density vs. functions of composition.

The density and viscosity of seven mixtures from ORNL are also reported.

DENSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES

composition given in mole %

2 mole % UF₄
Series

76 NaF	22 BeF ₂	2 UF ₄	70 NaF	28 BeF ₂	2 UF ₄	64 NaF	34 BeF ₂	2 UF ₄	58 NaF	40 BeF ₂	2 UF ₄	52 NaF	46 BeF ₂	2 UF ₄	46 NaF	52 BeF ₂	2 UF ₄	Comments
density	Temp		density	Temp		density	Temp		density	Temp		density	Temp		density	Temp		
(gms/cm ³)	°C		(gm/cm ³)	°C		(gms/cm ³)	°C											
2.0946	909.8		2.0971	896.5		2.0973	893.3		2.0619	909.0		2.0507	908.0		2.0366	907.8		
2.1202	860.8		2.1185	849.3		2.1219	846.3		2.0889	858.0		2.0743	858.8		2.0628	858.5		
2.1459	809.8		2.1441	799.3		2.1375	793.5		2.1135	810.0		2.0998	809.8		2.0838	808.8		
2.1719	761.5		2.1692	749.3		2.1649	735.8		2.1360	758.8		2.1254	761.3		2.1060	759.5		
Slushy	712.2		2.1976	695.0		2.1911	684.2		2.1618	710.3		2.1504	712.7		2.1319	710.0		
2.1735	760.0		2.2244	645.3		2.2218	630.0		2.1924	660.8		2.1769	664.0		2.1567	660.3		
2.1798	749.3		2.2535	593.1		2.2517	576.3		2.2191	613.1		2.2147	588.9		2.1813	610.3		
2.1782	738.2		2.2828	542.5		2.2796	530.8		2.2492	561.0		2.2613	506.0		2.2043	558.7		
2.1808	731.2		Frozen	509.3		Mushy	501.3		2.2796	508.0		2.3080	423.8		2.2293	506.0		
Slushy	726.5		2.1588	767.1					2.3096	459.8		2.3429	360.5		2.2584	453.5		
			2.2149	667.6					2.3264	431.0					2.2860	401.3		
									Mushy	358.7					2.3094	358.4		
															2.3302	322.8		
															Frozen	304.5		



DENSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES

Composition given in Mole %

4 mole % UF₄ series

76 NaF	20 BeF ₂	4 UF ₄	70 NaF	26 BeF ₂	4 UF ₄	64 NaF	32 BeF ₂	4 UF ₄	58 NaF	38 BeF ₂	4 UF ₄	52 NaF	44 BeF ₂	4 UF ₄	46 NaF	50 BeF ₂	4 UF ₄	Comments
density	Temp																	
(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		
2.2712	902.5		2.2915	907.3		2.2956	904.8		2.2513	907.8		2.2150	912.3		2.2599	908.0		
2.2829	879.5		2.3211	858.3		2.3186	858.8		2.2767	857.8		2.2459	858.3		2.2570	857.8		
2.2974	854.5		2.3448	809.3		2.3420	807.3		2.3012	807.2		2.2742	809.3		2.2705	809.3		
2.3102	829.1		2.3749	758.5		2.3695	759.0		2.3286	759.0		2.3031	760.5		2.2950	757.8		
2.3244	804.0		2.4108	708.0		2.3981	708.5		2.3557	707.3		2.3332	709.2		2.3213	707.8		
2.3378	778.7		2.4365	660.3		2.4275	659.3		2.3868	656.9		2.3635	658.0		2.3465	658.2		
2.3533	752.5		2.4689	609.9		2.4618	606.3		2.4171	604.7		2.3920	608.9		2.3748	607.0		
2.3678	726.9		2.5025	559.3		2.4948	556.0		2.4490	554.0		2.4223	558.4		2.4033	556.8		
Slushy	702.9		Frozen	503.0		Frozen	504.9		2.4843	500.5		2.4529	507.8		2.4343	506.2		
2.3207	828.7					2.3136	858.2		2.5208	451.5		2.4559	456.4		2.4672	453.8		
2.2938	878.0																	



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DENSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURE

Compositions given in mole %

6 Mole % UF₄ Series

76 NaF	18 BeF ₂	6 UF ₄	70 NaF	24 BeF ₂	6 UF ₄	64 NaF	30 BeF ₂	6 UF ₄	58 NaF	36 BeF ₂	6 UF ₄	52 NaF	42 BeF ₂	6 UF ₄	46 NaF	48 BeF ₂	6 UF ₄	Comments
density	Temp																	
(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		
2.4800	907.5		2.4469	904.5		2.4349	904.8		2.3847	914.3		2.4125	905.5		2.3970	908.8		solid
2.5082	862.3		2.4771	858.5		2.4548	855.5		2.4133	860.5		2.4167	857.5		2.4252	860.8		line
2.5325	809.5		2.5015	808.0		2.4749	807.0		2.4371	813.2		2.4452	807.8		2.4423	809.8		indi-
2.5666	758.3		2.5306	757.8		2.5070	755.2		2.4622	763.5		2.4683	756.6		2.4600	760.0		cates
2.5994	711.0		2.5620	708.5		2.5369	704.5		2.4924	713.1		2.4987	708.5		2.4828	712.2		data
Mushy	660.5		2.5934	657.1		2.5633	654.8		2.5210	661.8		2.5367	657.8		2.5165	658.8		below
2.5330	817.0		2.6280	607.0		2.6003	600.9		2.5508	609.3		2.5691	608.0		2.5445	611.8		line
			2.6636	559.1		2.6350	551.1		2.5825	562.5		2.6025	556.5		2.5748	558.7		obtained
			2.7399	506.5		2.6722	500.9		2.6185	508.4		2.6398	506.0		2.6072	504.7		from
			Frozen	482.5		2.4239	899.3					2.4131	552.5		2.6210	485.0		new
						2.4661	846.3					2.4123	908.0		2.4106	908.8		mixture.
						2.4988	790.8					2.4267	857.5		2.4255	860.8		
						2.5257	735.5					2.4447	809.2		2.4425	809.8		
						2.5503	695.8					2.4684	758.0		2.4600	760.0		
						2.5808	646.8					2.4978	710.8		2.4828	712.2		
						2.6135	594.3					2.5341	659.5		2.5164	658.8		
						2.6463	546.3					2.5693	608.7		2.5448	611.8		
												2.6006	559.6		2.5750	558.7		
												2.6235	523.8		2.6074	504.7		
												2.6335	508.7		2.6209	485.0		
												2.6348	499.1					

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DENSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES

8 mole % UF₄ Series.

Compositions given in mole %

76 NaF	16 BeF ₂	8 UF ₄	70 NaF	22 BeF ₂	8 UF ₄	64 NaF	28 BeF ₂	8 UF ₄	58 NaF	34 BeF ₂	8 UF ₄	52 NaF	40 BeF ₂	8 UF ₄	46 NaF	46 BeF ₂	8 UF ₄	Comments
density	Temp																	
(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		
2.6369	907.5		2.6439	899.3		2.6282	902.8		2.5996	903.8		2.5948	908.5		2.5783	900.8		dashed line
2.6545	849.8		2.6799	850.5		2.6545	850.8		2.6262	848.4		2.6361	860.5		2.6320	850.8		indicates
2.6867	798.2		2.6834	825.5		2.6874	800.5		2.6495	802.8		2.6499	808.3		2.6315	800.8		data below
2.7189	744.8		2.7111	774.8		2.7170	750.8		2.6784	747.0		2.6646	757.2		2.6622	752.8		line ob-
2.7409	711.5		2.7452	721.8		2.7452	705.0		2.7037	704.0		2.7006	702.5		2.6896	699.3		tained from
2.7565	687.8		2.7782	676.3		2.7812	653.5		2.7376	649.3		2.7295	653.5		2.7218	648.4		same
			2.8154	626.3		2.8024	624.0		2.7832	598.3		2.7675	601.2		2.7533	598.8		mixture re-
			2.8494	599.0		2.8206	602.3		2.8201	543.8		2.8040	550.4		2.7803	547.5		melted on
			2.8902	524.7		2.8335	580.7					2.6510	829.1		2.8127	495.3		following
			2.9107	504.7		2.8466	558.4					2.5782	913.8					day.
			Frozen	472.7		2.8625	537.1					2.5966	892.8					
			2.7241	769.0		2.8814	512.7					2.6148	871.8					
						2.7105	789.8					2.6175	852.0					
						2.7713	686.3					2.6149	830.8					
						2.8450	582.5					2.6150	809.0					
												2.6229	784.3					
												2.6565	715.5					
												2.7241	620.2					

DENSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES
Compositions given in mole %

10 mole % UF₄
Series

76	14	10	70	20	10	64	26	10	58	32	10	52	38	10	46	44	10	Comments
NaF	BeF ₂	UF ₄																
density	Temp		density	Temp		density	Temp		density	Temp		density	Temp		density	Temp		
(gm/cm ³)	C		(gm/cm ³)	C		(gm/cm ³)	C		(gm/cm ³)	C		(gm/cm ³)	C		(gm/cm ³)	C		
2.8628	905.0		2.8227	910.8		2.8533	845.5		2.7804	900.3		2.7325	900.8		2.8016	898.5		dashed line
2.8976	864.8		2.8278	870.5		2.9136	753.1		2.8114	849.1		2.7765	849.1		2.8355	851.0		indicates
2.9109	823.5		2.8478	841.5		2.7711	902.5		2.8235	802.3		2.8052	797.0		2.8578	801.0		data be-
2.9376	773.0		2.8770	796.5		2.8115	861.8		2.8448	748.3		2.8278	750.0		2.8379	751.8		low line
2.9514	728.3		2.9123	741.8		2.8428	814.0		2.8740	703.1		2.8567	699.4		2.8593	697.6		obtained
2.9788	683.5		2.9300	716.2		2.8788	766.0		2.9136	650.7		2.8903	646.0		2.9019	645.6		from same
2.9241	798.4		2.9531	688.7		2.9112	719.8		2.9561	598.8		2.9231	600.9		2.9352	593.1		mixture
2.9600	746.5		2.9737	662.4		2.9508	666.2		2.9963	547.8		2.9789	550.4		2.9633	545.5		remelted
2.9777	681.1		2.9899	647.3		2.9832	625.0		1.8695	493.0		1.8838	507.0		2.5928	487.2		on follow-
2.9901	663.4		3.0109	610.7		3.0071	592.7		1.6259	484.9		1.4482	494.4		2.3220	476.9		ing day.
3.0038	644.9		3.0316	586.0		3.0278	568.5		2.8467	796.3		2.7212	898.0		2.7233	892.5		
3.0226	632.7		3.0562	563.8		3.0433	546.5					2.7626	850.8		2.7646	845.3		
2.8570	854.0		3.0682	545.5		3.0616	525.8					2.8134	775.6		2.8293	796.8		
2.8686	814.3		3.0916	516.7		2.7234	502.8					2.9558	572.5		2.7595	808.5		
2.8854	787.8		3.1107	493.5														
2.9184	736.4		3.1170	486.3														
2.9552	684.9																	
2.9758	658.3																	
2.9962	645.1																	
3.0103	633.4																	
2.9073	765.5																	
2.9272	735.8																	
2.9638	685.3																	
3.0074	645.3																	

~~SECRET~~
 DENSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES
 Compositions given in mole %

12 mole % UF₄
Series

76	12	12	70	18	12	64	24	12	58	30	12	52	36	12	46	42	12	Comments
NaF	BeF ₂	UF ₄																
density	Temp		density	Temp		density	Temp		density	Temp		density	Temp		density	Temp		
(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		(gm/cm ³)	°C		
2.9361	896.5		2.9496	903.5		2.9410	903.5		2.9177	902.5		2.9228	903.0		2.9538	902.5		dashed line indicates
2.9731	848.2		2.9772	850.0		2.9515	852.8		2.9515	851.5		2.9740	847.2		2.9596	855.5		data below
3.0134	796.0		3.0130	798.7		2.9749	798.8		2.9797	802.0		2.9950	798.7		2.9910	803.7		line obtained from
3.0571	747.0		3.0532	745.3		3.0061	748.5		3.0187	748.1		3.0108	743.8		3.0099	754.5		same mixture
3.1038	693.3		3.0898	696.2		3.0463	699.5		3.0596	689.1		3.0318	692.0		3.0254	705.3		remelted on
3.1259	666.6		3.1298	644.2		3.0849	649.1		3.0836	640.2		3.0634	646.5		3.0596	654.8		following
3.1462	639.5		3.1717	593.6		3.1302	598.3		3.1180	592.2		3.1132	589.5		3.0909	603.5		day.
3.1615	614.7		3.1967	563.1		3.1587	562.0		3.1547	544.3		2.9261	903.2		3.1327	548.9		Solid line
3.1812	589.8		3.2155	540.7		3.1739	544.0					2.9414	851.2		2.9536	905.5		indicates
3.2064	559.3		3.2340	518.3		2.8920	907.5					2.9548	802.0		2.9990	849.3		data below
<u>Freezing</u>	<u>529.1</u>		3.2538	494.2		2.9320	858.5					2.9925	751.2		2.9876	800.8		line obtained from
2.9497	902.3		3.2750	467.5		2.9643	807.5					3.0286	702.2		3.0074	748.1		new mixture
2.9666	872.8		<u>Freezing</u>	<u>457.0</u>		3.0015	760.0					3.0690	648.2		3.0234	693.8		
3.0021	818.0		3.0773	719.3		3.0408	703.3					3.1076	602.5		3.0553	642.5		
3.0339	766.4		2.9600	909.0		3.0775	652.0					2.9061	893.0		3.1154	588.8		
3.0806	711.5		2.9867	853.8		3.1203	603.0					2.9532	846.8		3.1540	551.3		
3.0994	684.2		3.0043	817.3		3.1611	553.0								3.1730	515.3		
3.1221	651.6		3.0477	749.8											2.9232	903.3		
3.1420	623.8		3.0809	702.8											2.9601	866.0		
3.1654	599.0		3.1192	657.1											2.9931	824.3		
3.1877	573.5		3.1586	601.6											3.0249	771.0		
3.1990	561.3		3.1977	556.5											3.0392	715.0		
3.2082	547.8		3.2282	520.9											3.0266	673.8		
			3.2510	494.5											3.1073	570.0		
			2.9867	468.8											3.1381	543.1		
															3.0811	598.8		

VISCOSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES
 Compositions given in mole %

Composition			600°C			800°C		
NaF	BeF ₂	UF ₄	η (poise)	ρ (g/cm ³)	η/ρ	η (poise)	ρ (g/cm ³)	η/ρ
76	12	12	--	3.171	--	.0452	3.017	.0150
70	18	12	.1002	3.162	.0317	.0353	3.013	.0117
64	24	12	.0821	3.122	.0263	.0289	2.983	.0097
58	30	12	.1280	3.117	.0411	.0331	2.986	.0111
52	36	12	.1290	3.104	.0416	.0289	2.973	.0097
46	42	12	.1780	3.094	.0575	.0369	2.978	.0124
76	14	10	--	3.031	--	.0313	2.879	.0109
70	20	10	.1200	3.024	.0397	.0510	2.874	.0177
64	26	10	.1001	3.002	.0333	.0316	2.852	.0111
58	32	10	.1180	2.954	.0399	.0297	2.804	.0106
52	38	10	.1004	2.926	.0343	.0271	2.794	.0097
46	44	10	.2790	2.927	.0953	.0657	2.797	.0235
76	16	8	--	Solid	--	.0450	2.687	.0167
70	22	8	.0946	2.834	.0334	.0271	2.695	.0101
64	28	8	.0882	2.819	.0313	.0293	2.683	.0109
58	34	8	.1002	2.779	.0360	.0302	2.650	.0114
52	40	8	.1190	2.767	.0430	.0331	2.639	.0125
46	46	8	.1470	2.749	.0535	.0403	2.632	.0153
76	18	6	--	Solid	--	.0361	2.543	.0142
70	24	6	.0603	2.633	.0229	.0409	2.505	.0163
64	30	6	.0912	2.604	.0350	.0358	2.481	.0144
58	36	6	.0834	2.601	.0321	.0311	2.477	.0126
52	42	6	.1270	2.573	.0494	.0349	2.440	.0143
46	48	6	.2230	2.579	.0865	.0468	2.441	.0192
76	20	4	--	Solid	--	.0261	2.328	.0112
70	26	4	.0629	2.476	.0254	.0226	2.350	.0096
64	32	4	.0740	2.467	.0300	.0310	2.345	.0132
58	38	4	.0972	2.443	.0398	.0342	2.313	.0148
52	44	4	.1284	2.397	.0536	.0431	2.279	.0189
46	50	4	.1647	2.381	.0692	.0440	2.275	.0193
76	22	2	--	Solid	--	.0261	2.152	.0121
70	28	2	.0629	2.249	.0280	.0226	2.144	.0105
64	34	2	.0740	2.254	.0328	.0310	2.144	.0145
58	40	2	.0972	2.227	.0436	.0342	2.118	.0161
52	46	2	.1284	2.211	.0580	.0431	2.104	.0201
46	54	2	.1647	2.181	.0755	.0440	2.082	.0211
*76	24	0	--	2.126	--	.0299	2.018	.0148
70	30	0	.0498	2.113	.0236	.0281	2.012	.0140
64	36	0	.0591	2.108	.0280	.0309	2.008	.0154
58	42	0	.0883	2.103	.0420	.0352	2.005	.0176
52	48	0	.1282	2.098	.0611	.0415	1.992	.0208
46	54	0	.2090	2.058	.1016	.0536	1.985	.0270

* interpolated values from binary error.

VISCOSITY AND DYNAMIC VISCOSITY OF NaF, BeF₂, UF₄ TERNARY MIXTURES

2 UF₄ Mole %
Series

Composition given in mole %

Central File No. 55-11-14

76 NaF, 22 BeF ₂ , 2 UF ₄			70 NaF, 28 BeF ₂ , 2 UF ₄			64 NaF, 34 BeF ₂ , 2 UF ₄			58 NaF, 40 BeF ₂ , 2 UF ₄			52 NaF, 46 BeF ₂ , 2 UF ₄			46 NaF, 52 BeF ₂ , 2 UF ₄		
η	η/ρ	temp															
Poise	Stokes	°C															
.0197	.0093	880	.0183	.0087	878	.0252	.0119	870	.0265	.0127	874	.0324	.0157	874	.0330	.0160	854
.0246	.0115	824	.0209	.0098	823	.0304	.0143	815	.0362	.0171	800	.0560	.0266	795	.0499	.0238	782
.0296	.0137	773	.0250	.0116	770	.0357	.0165	766	.0498	.0231	722	.0639	.0298	720	.0776	.0364	708
.0698	.0319	721	.0309	.0141	720	.0433	.0198	716	.0733	.0333	649	.0962	.0440	647	.1331	.0614	633
			.0393	.0178	668	.0536	.0242	663	.1167	.0521	573	.1561	.0703	571	.2197	.0999	562
			.0571	.0255	617	.0687	.0306	612	.2132	.0931	492	.2617	.1154	497	.4507	.2012	487
			.0781	.0344	567	.0945	.0415	557	.3876	.1661	416	.6229	.2695	417	1.192	.5219	408
															3.348	1.446	351

VISCOSITIES AND DYNAMIC VISCOSITIES OF NaF, BeF₂, UF₄ TERNARY MIXTURES

Composition given in mole %

8 Mole % UF₄
Series

Central File No. 55-11-114

76			70			64			58			52			46		
NaF	BeF ₂	UF ₄															
η	η/ρ	temp															
Poise	Stokes	°C															
.0284	.0107	864	.0203	.0076	860	.0246	.0093	870	.0292	.0112	876	.0262	.0101	882	.0294	.0113	865
.0415	.0155	821	.0277	.0103	808	.0277	.0103	821	.0233	.0089	827	.0295	.0112	821	.0394	.0150	816
.0501	.0185	770	.0305	.0112	757	.0332	.0123	774	.0346	.0130	776	.0385	.0145	772	.0510	.0193	771
.0587	.0214	720	.0462	.0168	710	.0416	.0152	720	.0435	.0162	732	.0518	.0193	723	.0507	.0189	712
			.0554	.0199	665	.0544	.0196	669	.0599	.0219	673	.0666	.0245	675	.0857	.0316	664
			.0941	.0333	613	.0730	.0260	624	.0802	.0290	672	.1326	.0478	586	.1252	.0457	617
			.1290	.0450	561	.1016	.0360	595	.1233	.0441	574						
						.1592	.0554	524	.0237	.0090	856						
									.0305	.0115	800						
									.0379	.0141	751						
									.0496	.0183	702						
									.0649	.0237	654						
									.0898	.0323	605						
									.1590	.0566	554						
									.2188	.0770	508						

-61-

VISCOSITIES AND DYNAMIC VISCOSITIES OF NaF, BeF₂, UF₄ TERNARY MIXTURES

10 Mole % UF₄
Series

Composition given in mole %

Central File No. 55-11-14

76			70			64			58			52			46		
NaF	BeF ₂	UF ₄															
η	η/ρ	temp															
Poise	Stokes	°C															
.0195	.0069	861	.0362	.0128	876	.0240	.0085	862	.0213	.0077	868	.0203	.0074	863	.0271	.0099	876
.0299	.0104	808	.0476	.0166	820	.0300	.0106	814	.0287	.0103	821	.0254	.0091	815	.0584	.0209	820
.0393	.0135	766	.0577	.0199	771	.0382	.0133	766	.0386	.0137	775	.0320	.0114	764	.0780	.0277	771
.1149	.0390	713	.0673	.0229	719	.0482	.0165	712	.0485	.0169	722	.0435	.0153	716	.1097	.0385	722
			.0895	.0301	666	.0651	.0221	663	.0747	.0257	672	.0634	.0220	665	.1669	.0579	669
			.1113	.0369	620	.0844	.0283	620	.0994	.0339	625	.0899	.0309	618	.2423	.0831	620
			.1426	.0468	570	.1220	.0403	572	.1484	.0499	572	.1459	.0495	566	.3094	.1050	573
			.1898	.0613	520				.2664	.0884	524	.2793	.0937	516	.5094	.1709	521

20

DENSITY OF OAK RIDGE SPECIAL SAMPLES

Compositions given in mole %

50% LiF 50% BeF ₂	69 % LiF 31 % BeF ₂	64% NaF 5% LiF #381 31% BeF ₂	#388	63.5% NaF 7.5% LiF #389 29.0% BeF ₂	56% NaF 16% LiF C-78 28% BeF ₂	Comments
density temp (gms/cm ³) °C	density temp (gms/cm ³) °C	density Temp (gms/cm ³) °C	density temp (gms/cm ³) °C	density temp (gms/cm ³) °C	density temp (gms/cm ³) °C	
1.8482 907.3	1.8240 911.0	1.9359 912.0	1.9045 910.8	1.9327 912.0	1.8550 911.0	Solid line indicates data below line ob- tained from new mixture.
1.8571 855.5	1.8545 859.0	1.9663 852.0	1.9340 861.8	1.9483 860.0	1.8747 860.8	
1.8856 799.6	1.8369 798.8	1.9923 793.8	1.9382 810.0	1.9660 812.8	1.8935 809.2	
1.9105 744.0	1.8543 749.0	2.0196 736.0	1.9579 761.0	1.9885 763.1	1.9028 762.0	
1.9340 685.6	1.8752 697.1	2.0589 660.0	1.9819 711.5	2.0144 712.3	1.9240 709.6	
1.9602 635.5	1.8989 645.1	2.0997 582.8	2.0067 662.0	2.0396 663.3	1.9452 661.3	
1.9771 583.3	1.9094 619.2	2.1119 560.0	2.0444 586.8	2.0670 611.4	1.9701 611.8	
1.9988 518.1	1.9180 597.6	2.1161 550.7	2.0826 512.0	2.0932 563.1	1.9927 562.0	
2.0223 433.8	1.9256 578.0	2.1206 541.3	2.1092 459.3	2.0772 512.7	2.0204 508.5	
2.0081 348.9	1.9481 530.0		2.1393 408.1	1.9295 902.0		
	1.9579 507.2		2.1794 356.7	1.9530 850.5		
	1.9589 501.1			1.9769 800.5		
	1.8299 864.5			2.0000 745.3		
				2.0248 700.0		
				2.0495 650.2		
				2.0752 598.8		
				2.1023 550.7		
				2.0025 722.5		

Central File No. 55-11-11

22

2-5-11-14

50% LiF

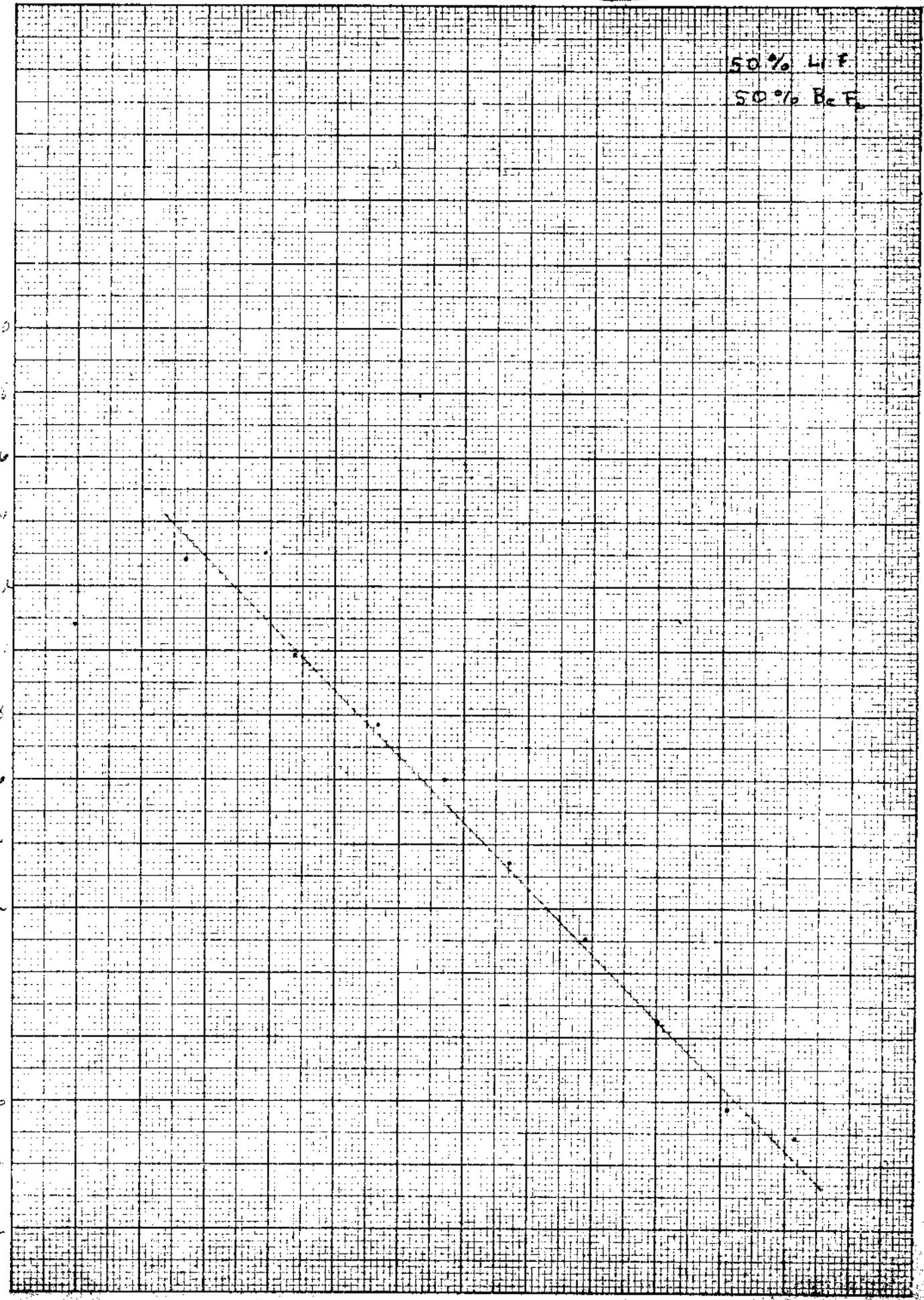
50% BeF₂

REUFEL & ERBER CO., N. Y. NO. 398-II
100 E. 13th St. New York, N. Y.
Engineering & Research
MADE IN U.S.A.

Density (g/cm³)

8571

1.80
1.82
1.84
1.86
1.88
1.90
1.92
1.94
1.96
1.98
2.00
2.02
2.04
2.06
2.08
2.10

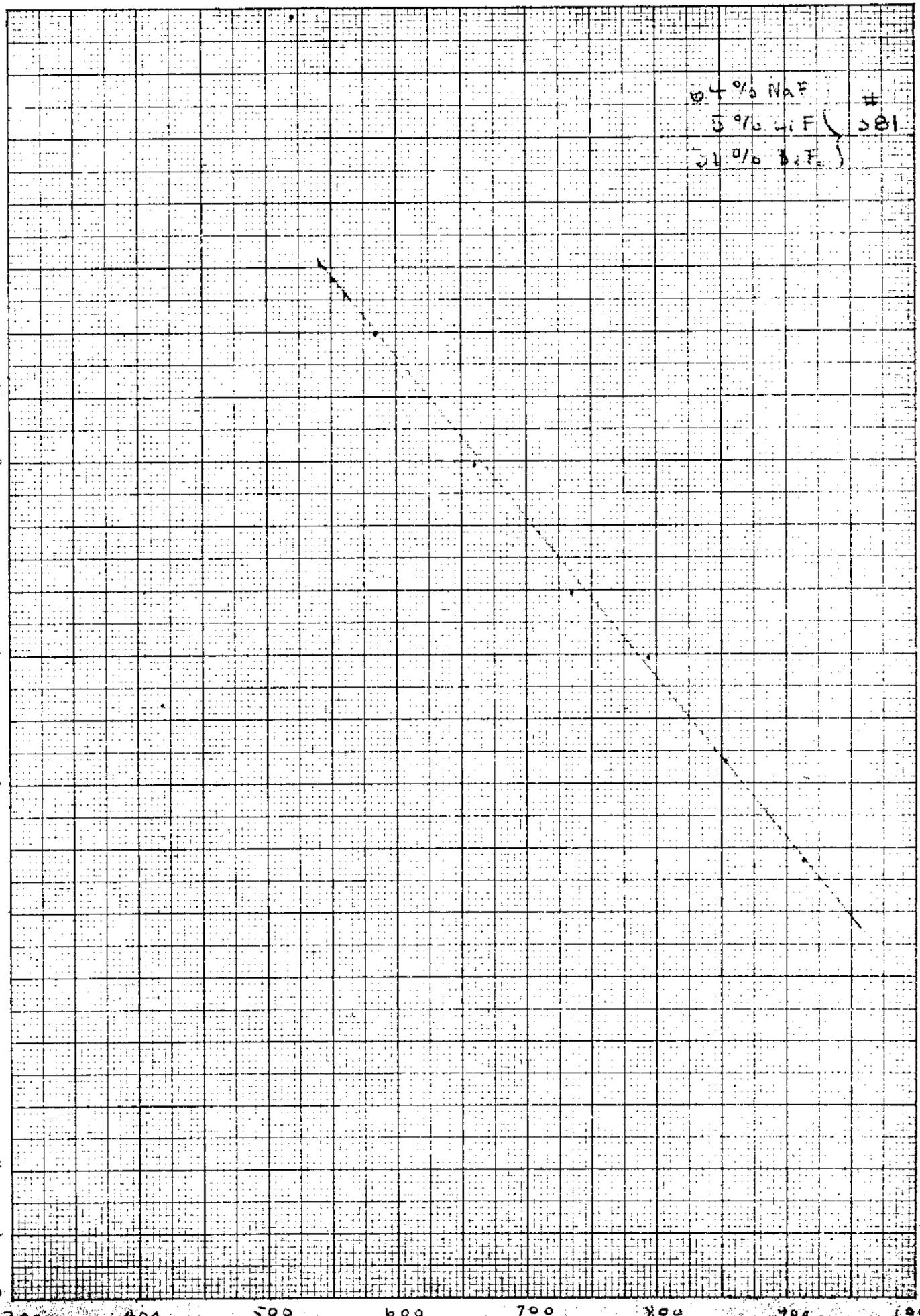


300 400 500 600 700 800 900 1000

Temp. (°C)

64% NaF
5% LiF } 381
31% B₂F₆

2.14
2.1
2.05
2.0
1.95
1.9
1.85
1.8
1.75
1.7
1.65
1.6
1.55
1.5
1.45
1.4
1.35
1.3
1.25
1.2
1.15
1.1
1.05
1.0
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0.0



3576
KUPFER & EBER CO., N. Y. NO. 354-11
110 W. 42nd St., New York 36, N.Y.
Engineering Dept.
MADE IN U.S.A.

Temp (°C)

20-11-14

F 388

NEUFEL & ESSER CO., N. Y. NO. 228-11
10 X 10 to the 4 Inch, 5th. High accuracy
Engineering, 7 X 10 in.
MADE IN U.S.A.

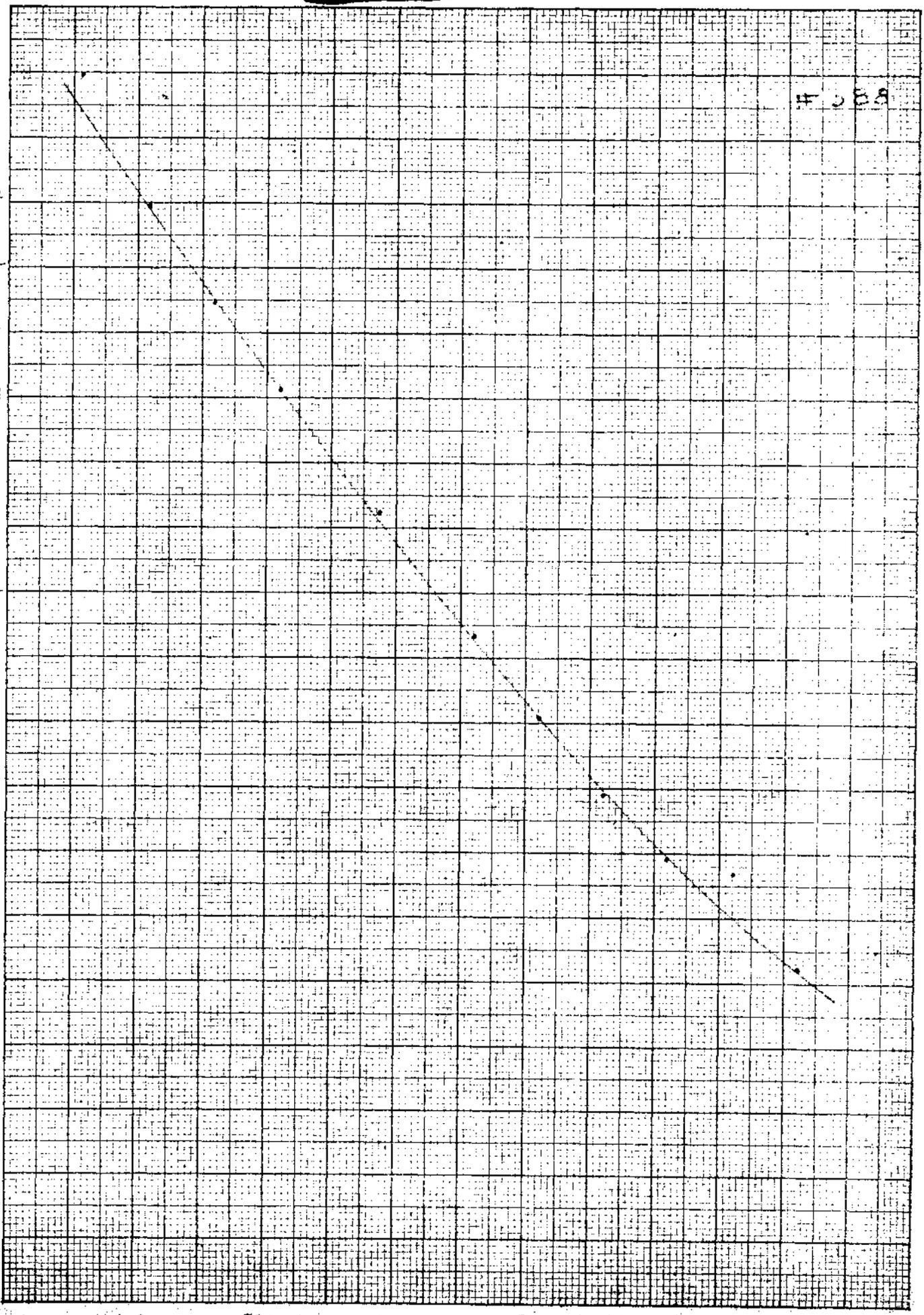
Vertical (°C)

8577

2.18
2.16
2.14
2.12
2.10
2.08
2.06
2.04
2.02
2.00
1.98
1.96
1.94
1.92
1.90
1.88
1.86
1.84
1.82
1.80

300 400 500 600 700 800 900 1000

Temp (°C)



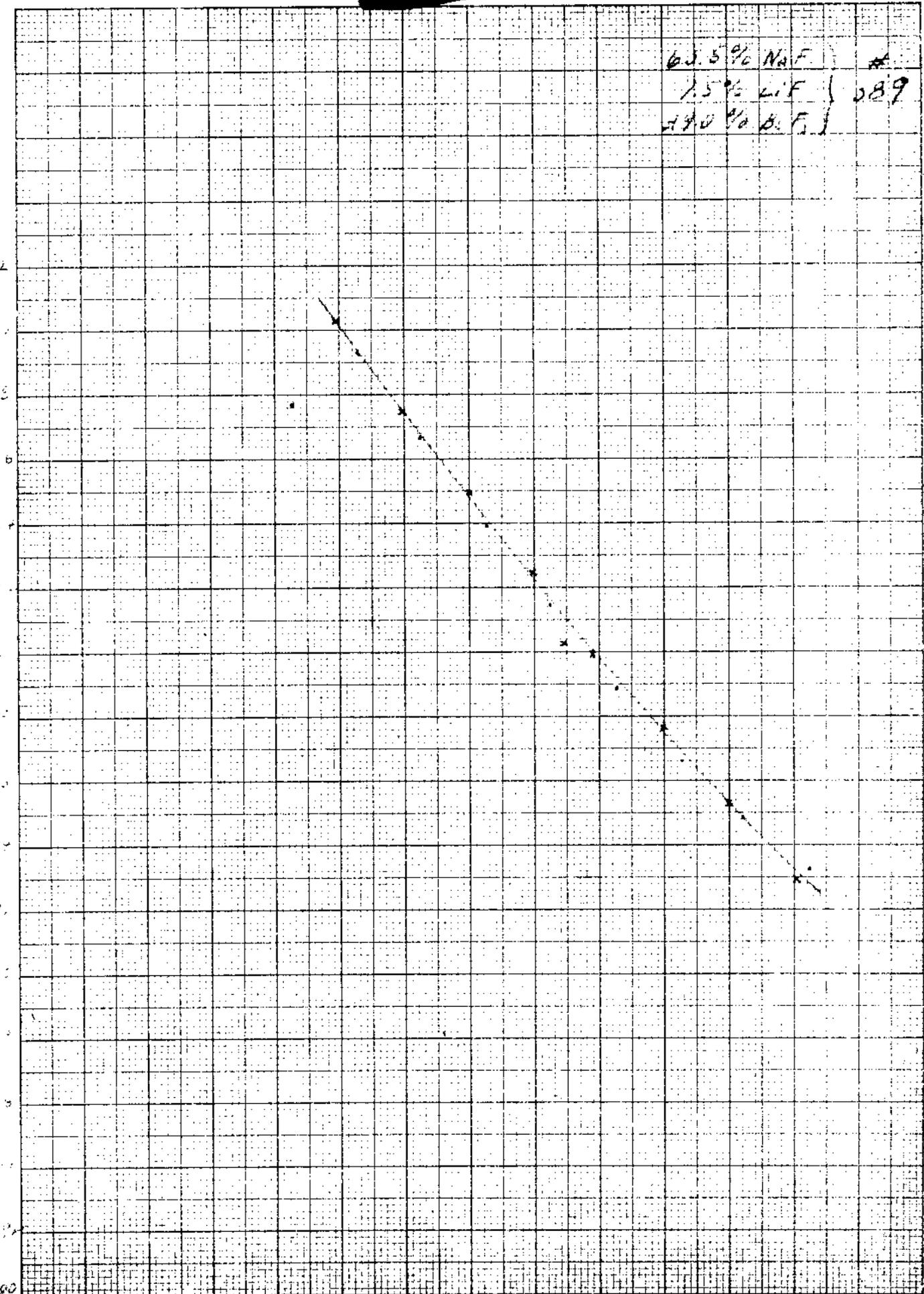
KLUPPEL & FASER CO., N. Y. NO. 385 II
100 E. 42nd St. New York 17, N. Y.
ENGINEERS & SCIENTISTS
MADE IN U. S. A.

8578

UNIVERSITY OF CALIFORNIA

63.5% NaF } #
1.5% LiF } 389
33.0% B₂O₃ }

2.12
2.10
2.08
2.06
2.04
2.02
2.00
1.98
1.96
1.94
1.92
1.90



Temp. (°C)

300 400 500 600 700 800 900 1000

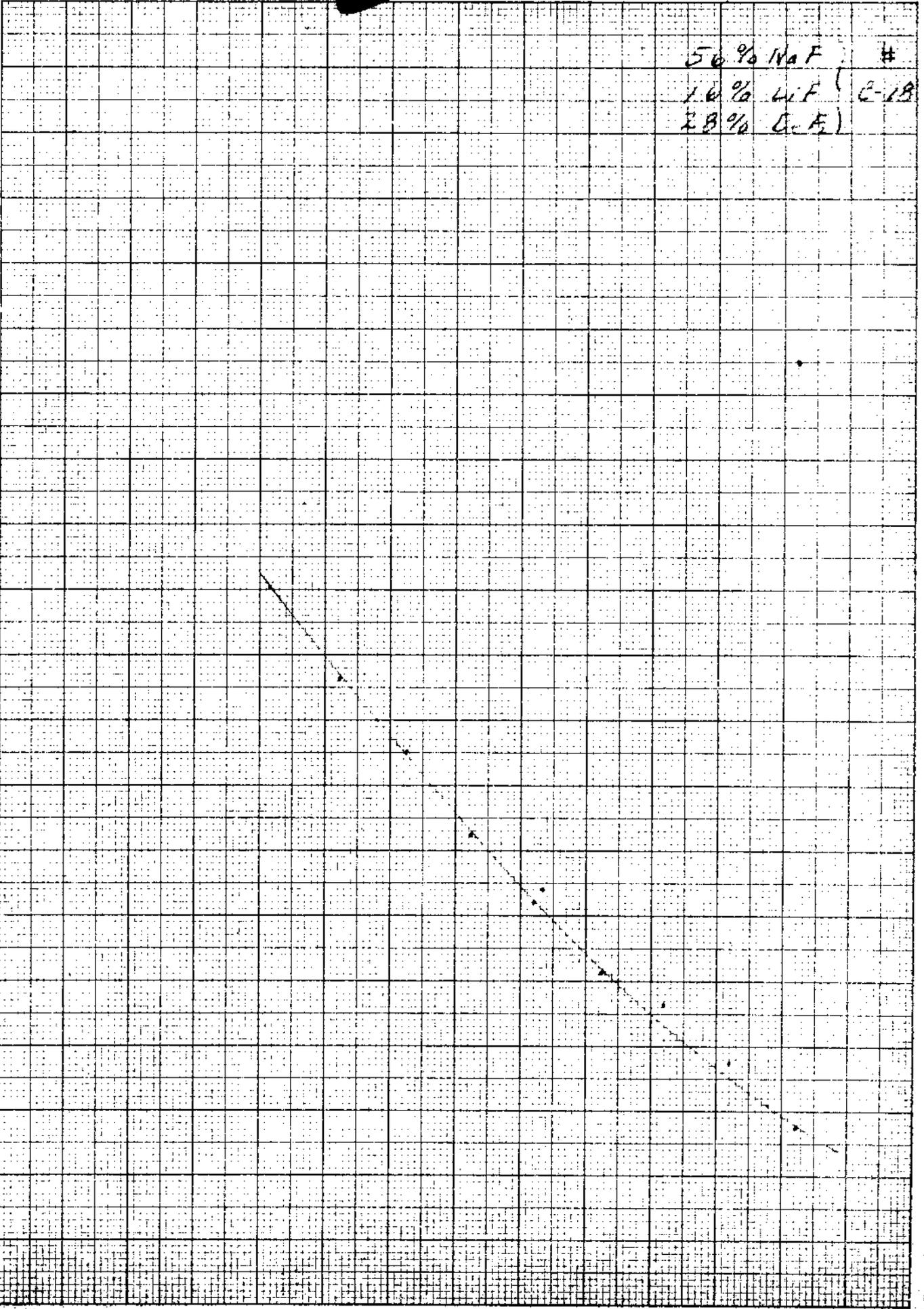
55-11-14

56% NaF #
16% LiF (C-18)
28% (C-18)

HEUFFEL & ESSER CO., N. Y. NO. 880-11
17 1/2 to 19 1/2 inch. dia. 1 inch or more
Eugenius, 7 x 10 in. D
MADE IN U.S.A.

1.8571

2.10
2.08
2.06
2.04
2.0
1.98
1.96
1.94
1.92
1.90



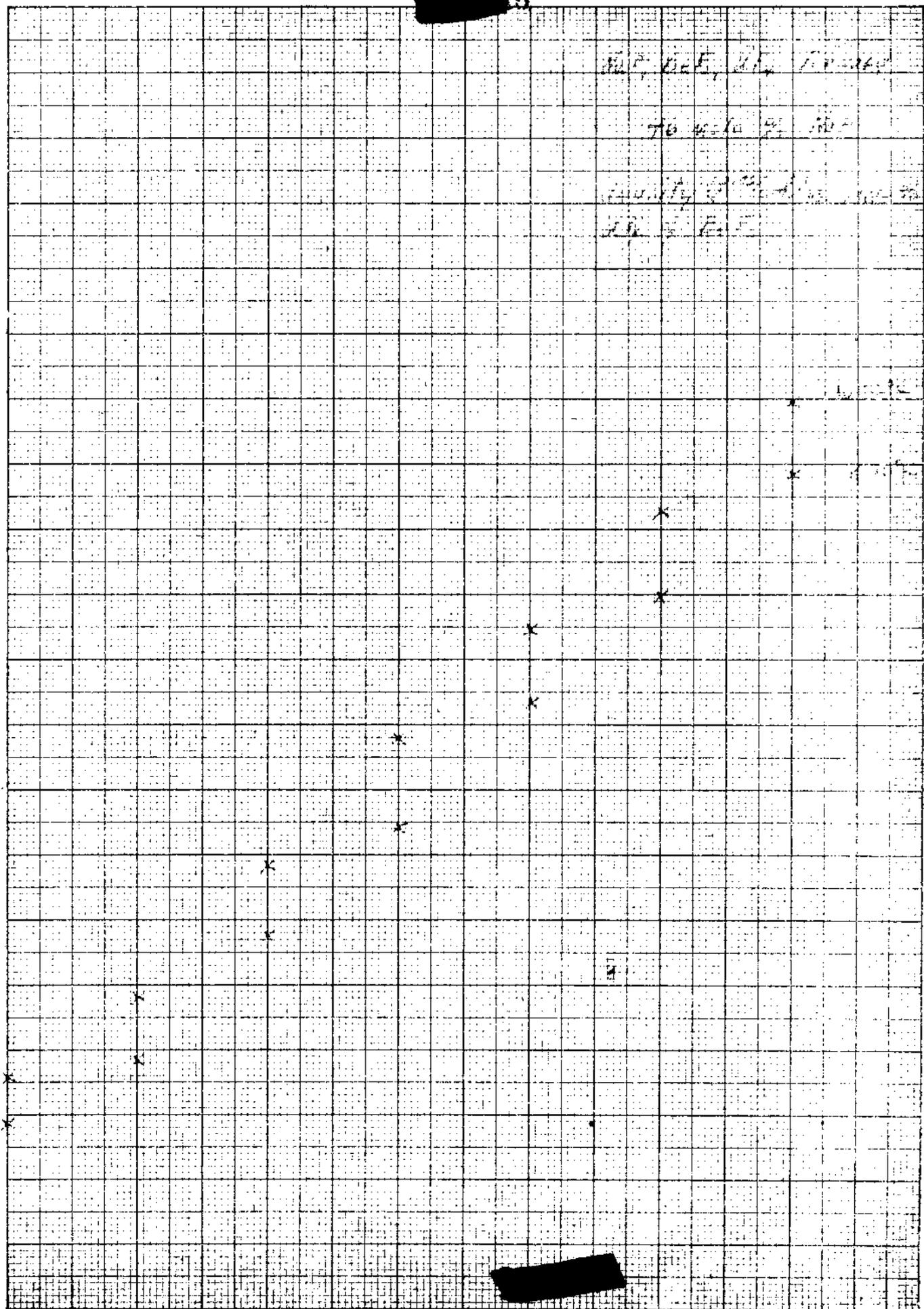
Temp (°C) - [redacted]

SECRET

TOP SECRET, U.S. PROPERTY

TO: [illegible]

FROM: [illegible]



NEUFEL & ESSEL CO., N. Y. NO. 388-11
12 x 18 in. 1/4 in. grid, 500 lines per inch.
Engraving, T. X. 10 in.
MADE IN U. S. A.

8080

SECRET

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

25-11-14

Not, but, by TERNARY

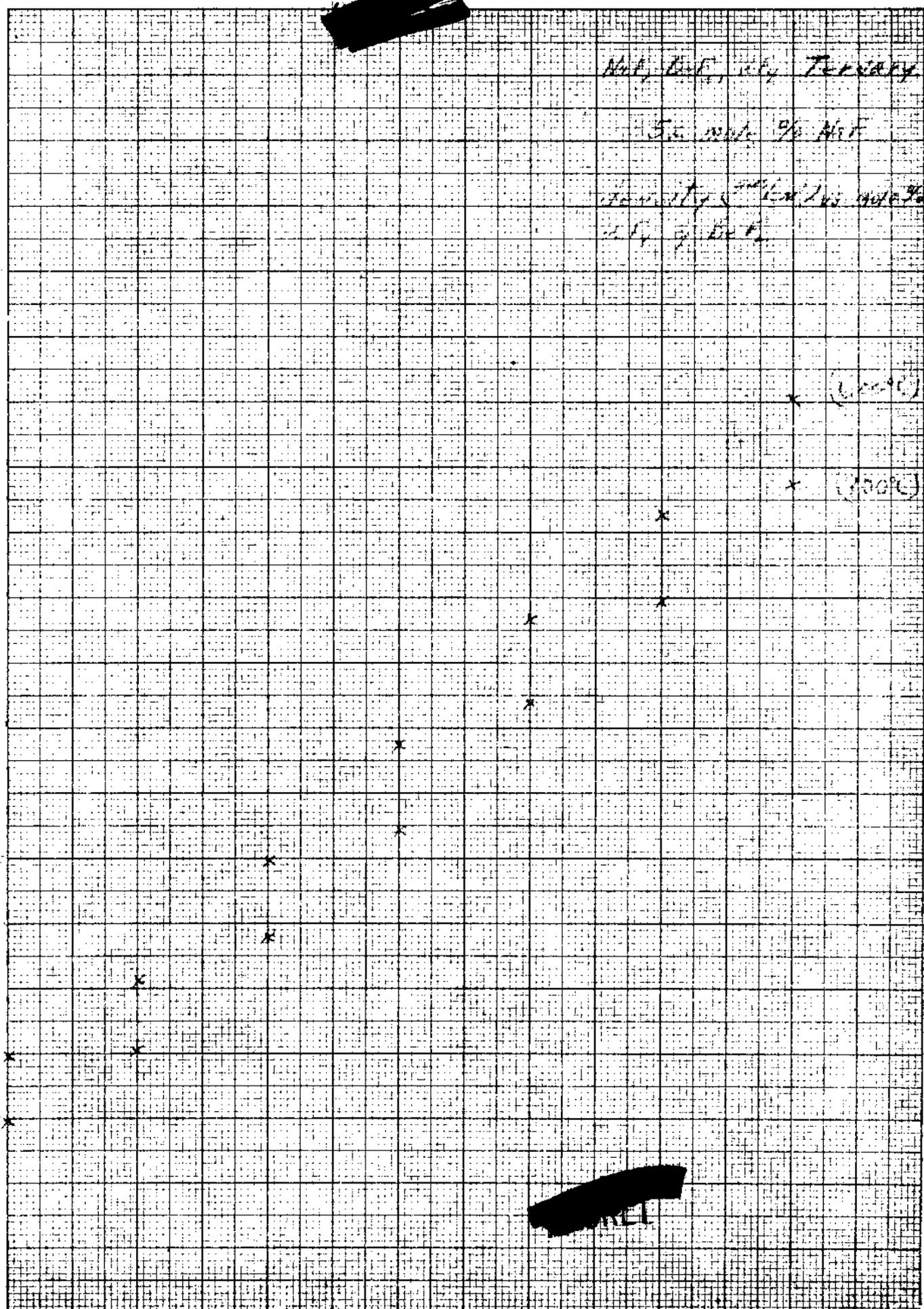
5. m. 9/10 HRT

ternary (1000) 1000

by 9/10

(1000)

(1000)



NEUFEL & ESSER CO., N. Y. NO. 250-11
10 X 10 to 100 X 100, 5th Flats covered.
Diameter, 7 X 10 in.
MADE IN U. S. A.

6001

NEUFEL

0 2 4 6 8 10 12 14 16 18 20
 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0

5-2-11-11

100 F. 100 F. 100 F. 100 F.

55 inch 10 100 F

100 F. 100 F. 100 F. 100 F.
100 F. 100 F.

x 100000

x 100000

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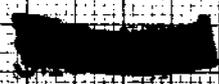
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*

KEUFFEL & ESSER CO., N. Y. NO. 889-11
10 X 10 to the 1/4 inch, 5th lines accented.
Imperial, 7 X 10 in.
MADE IN U.S.A.

80 F

0 20 40 60 80 100 120 140 160 180 200





A. P. B. E. 11, January

FD 100-16 10/1

domestic currency vs. note
10/1, 10/1

* 10/1

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* 10/1

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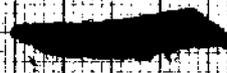
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0 30 1 1B 4 16 6 14 8 12 10 20 12 M 90 R F 19 ← M 90 R F

KEUFFEL & ESSER CO., N. Y., NO. 389-11
10 X 10 to the 1/2 inch, 5th Ed. Rev. 1954
Patented 7 X 10 in.
MADE IN U. S. A.

8000

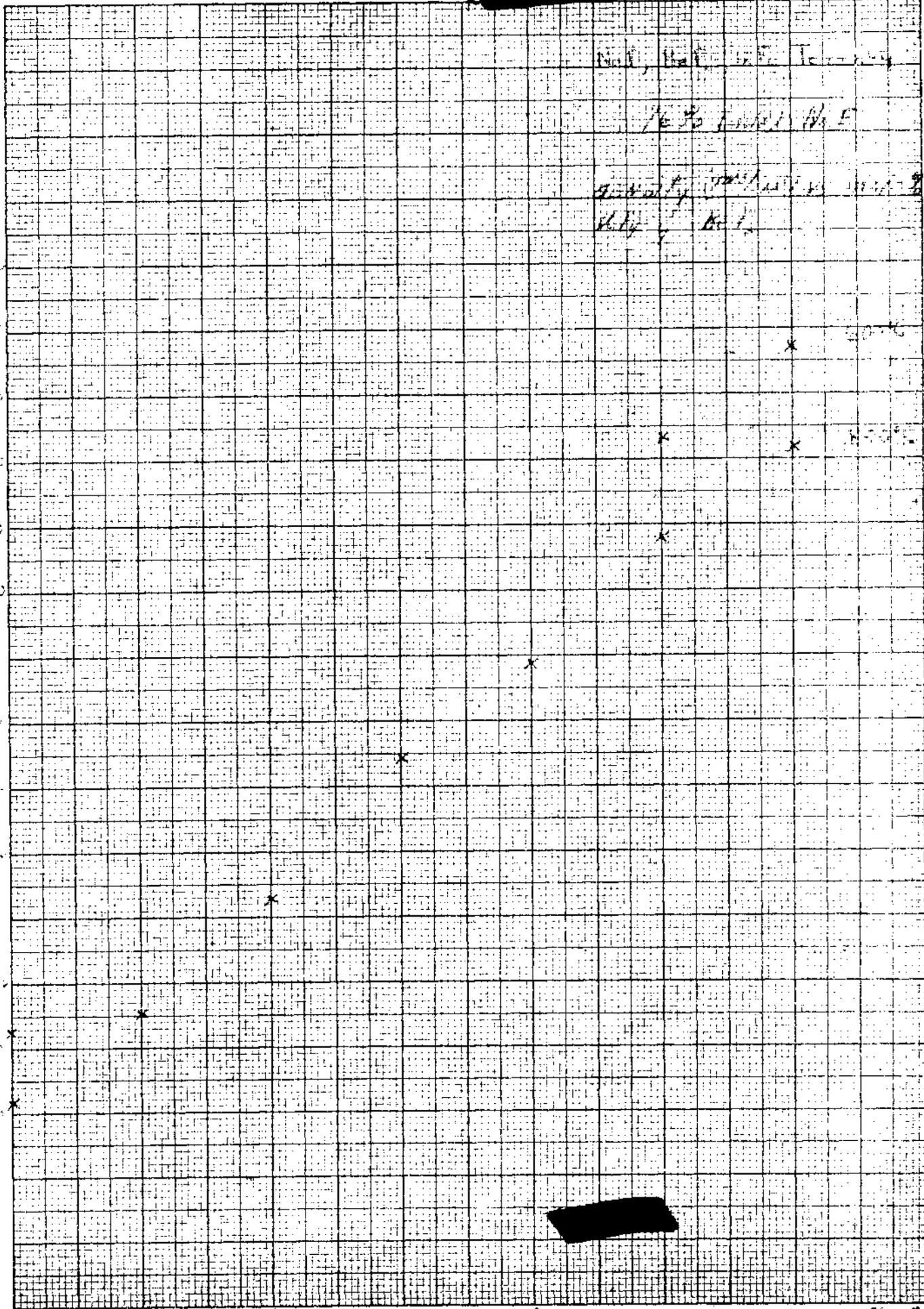
KEUFFEL & ESSER CO., N. Y. NO. 359-II
10 x 10 to the 1/2 inch, 20 lines per inch.
TRADE MARK, 7 x 10 in.
MADE IN U.S.A.

SECRET

Small, dark, illegible text

16 30 1-10-11 W.F.

Activity, 10-11-11
W.F. W.F.



800

0 2 4 6 8 10 12 14 16 18 20

10 M 90 U.F. →
14 m 90 B.F.

SECRET

M₁F, M₂F, M₃F, ...

... 76 ...

Intensity ...

... of ...

Intensity ...

1.20

1.15

1.10

1.05

1.00

(6 ...)

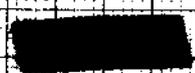
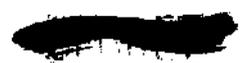
(5 ...)

KEUFFEL & ESSER CO., N. Y. NO. 890-1
10 x 10 in. 3 1/2 inch, 50% there advertised.
Eberhard, 7 x 10 in.
MADE IN U.S.A.

M% BeF₂ 46 52 58 64 70 76 M% NaF →

1.164

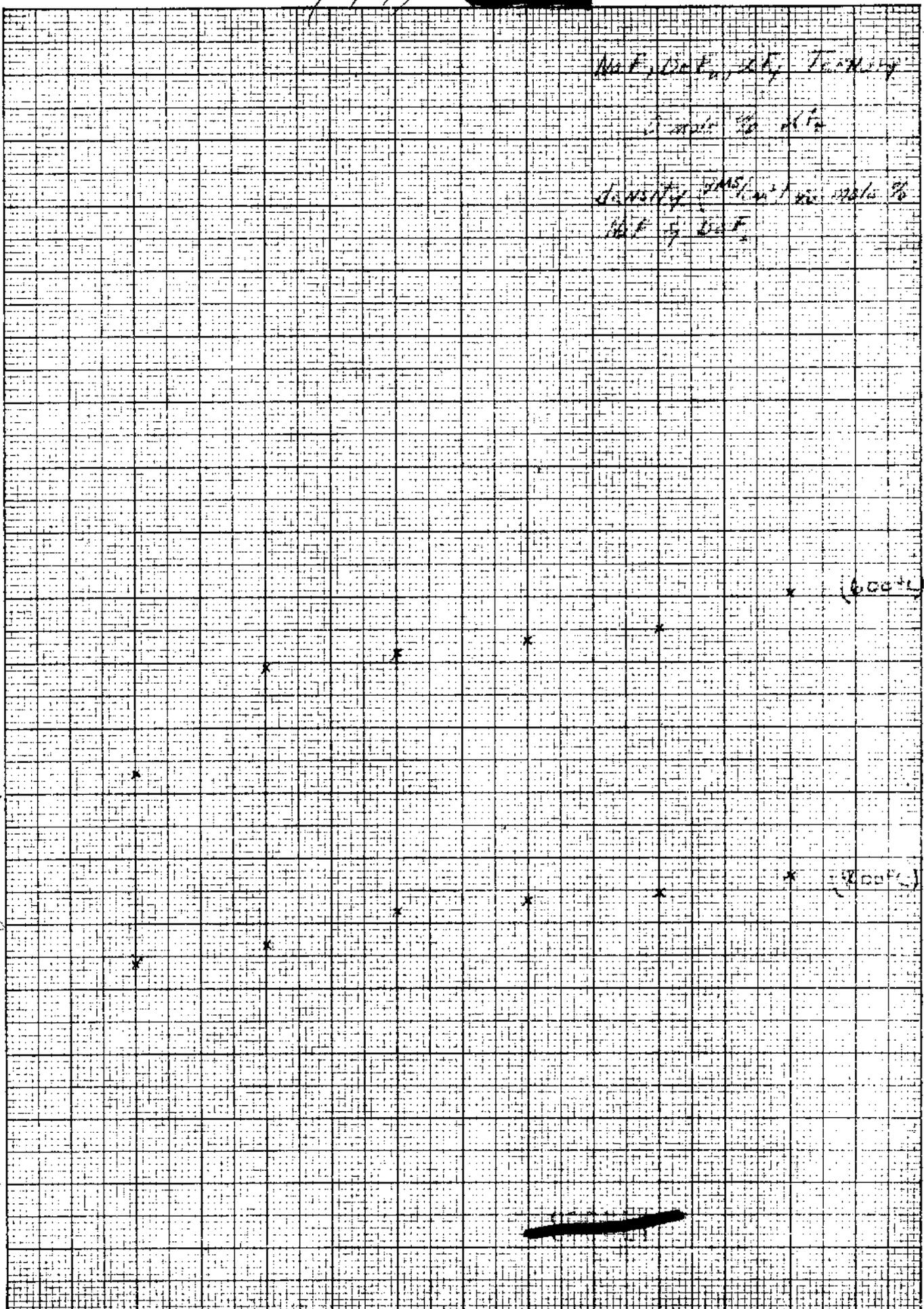
1.05 28



55-114

NaF, CaF₂, BaF₂, Tl₂CO₃
Density 7.55 g/cm³
NaF 50%
BaF₂ 50%

Density 7.55 g/cm³



(600°C)

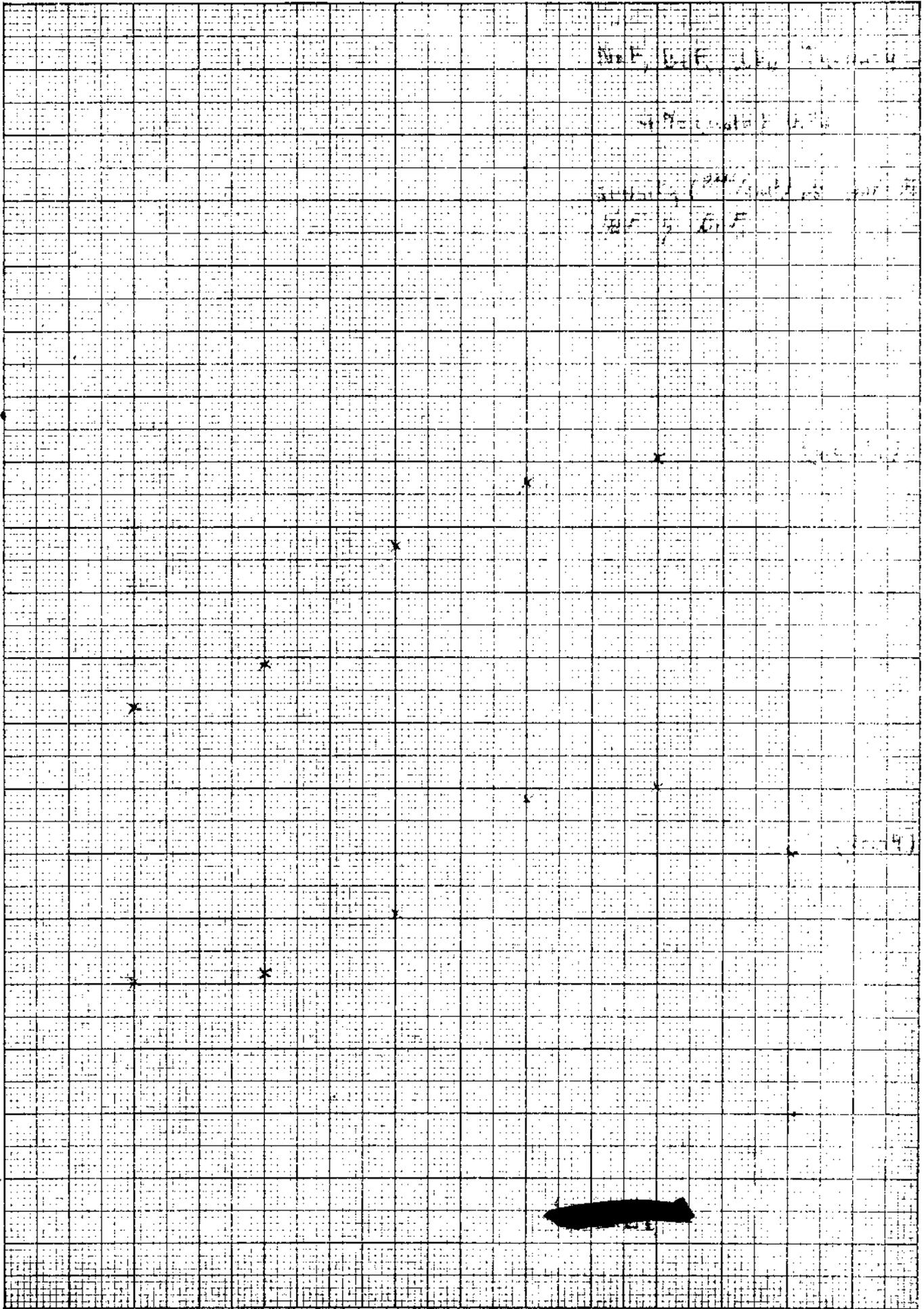
(700°C)

KEUFFEL & ESSER CO., N. Y. NO. 889-11
10 X 10 to the 1/2 inch, 5/16 lines spaced
Engraving, 7 X 10 in.
MADE IN U. S. A.

← M% BaF₂ 46 52 58 64 70 76 M% NaF →
 54 48 42 36 30 24

7.55 g/cm³ - 56 - 30

~~SECRET~~



No. F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40
 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60
 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

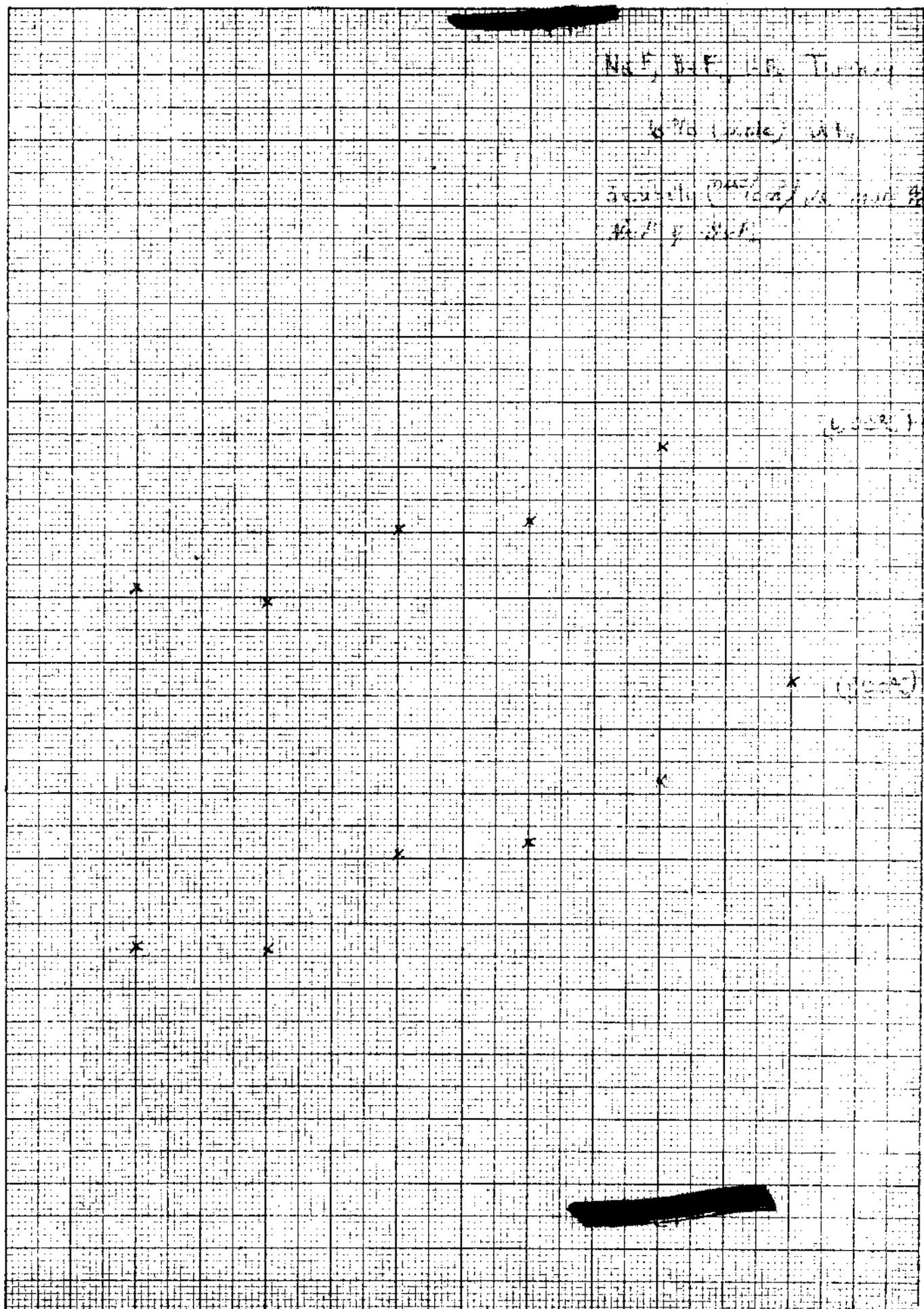
KEUFFEL & ESSER CO., N. Y. NO. 338-II
 10 X 14 in. 1/8 inch fish lines accented.
 Engraving, 7 X 10 in.
 MADE IN U. S. A.

~~SECRET~~

← No. Def. 46 50 54 58 62 66 70 74 78 82 86 90 94 98
 100

KEUFFEL & ESSER CO., N. Y. NO. 758-II
 10 x 10 to 1/2 inch, 5 1/2 lines spaced.
 Engraving, 7 x 10 in.
 MADE IN U.S.A.

NaF, BaF₂, LiF, Tl₂SO₄
 10¹⁰ (1000) 10¹⁰
 actually (1000) 10¹⁰ 10¹⁰
 10¹⁰ 10¹⁰

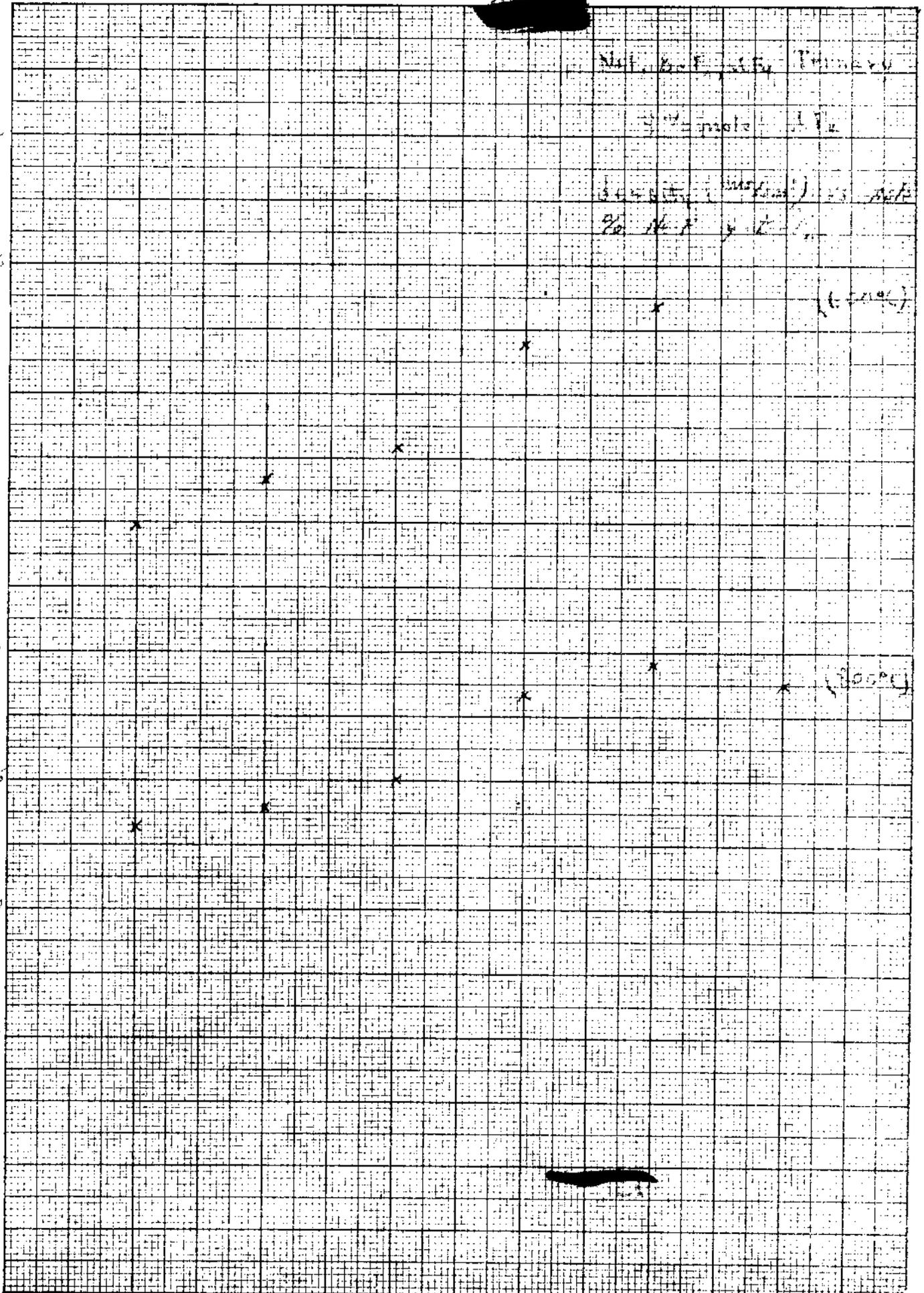


(1000)

(1000)

← M% BaF₂ 46 54 58 64 70 76 100% BaF₂
 48 42 36 30 24 18

SL/Net



KEUFFEL & ESSER CO., N. Y. NO. 88-11
 10 x 10 in. 1/4 inch, 5th lines accepted.
 Engraving, 7 x 10 in.
 MADE IN U. S. A.

← M₉₀ BCF₂ 46 52 58 64 70 76 M₉₀ BCF →
 46 40 24 20 24 16
 11 11 20 31

NaF, U₂F₈, H₂O, Fe₂O₃

1.50 (wt) U₂F₈

1.45 (wt) H₂O
0.5 (wt) Fe₂O₃

1.10

1.15

1.05

1.00

0.90

0.80

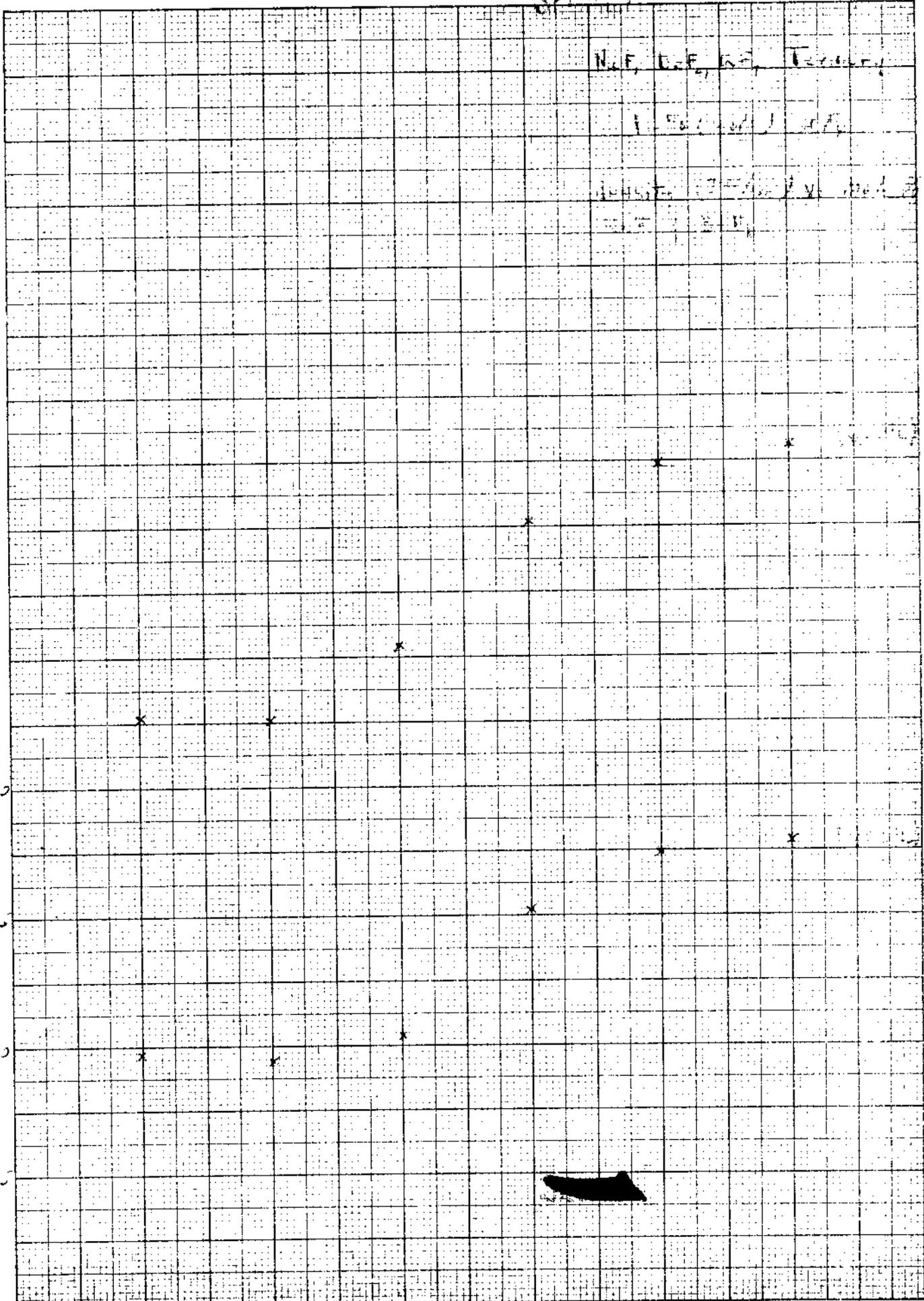
0.70

0.60

0.50

KEUFFEL & ESSER CO., N. Y. NO. 389-11
In use for the 5, 10, 20, 50, 100 lines admitted
Patented in U.S.A. & Foreign Countries

← M% U₂F₈ 46 52 58 64 70 76 M% NaF →
44 38 32 26 20 14



3.50
3.25
3.20
Density (gm/cm³)
3.10
3.05
3.00
2.95
2.90

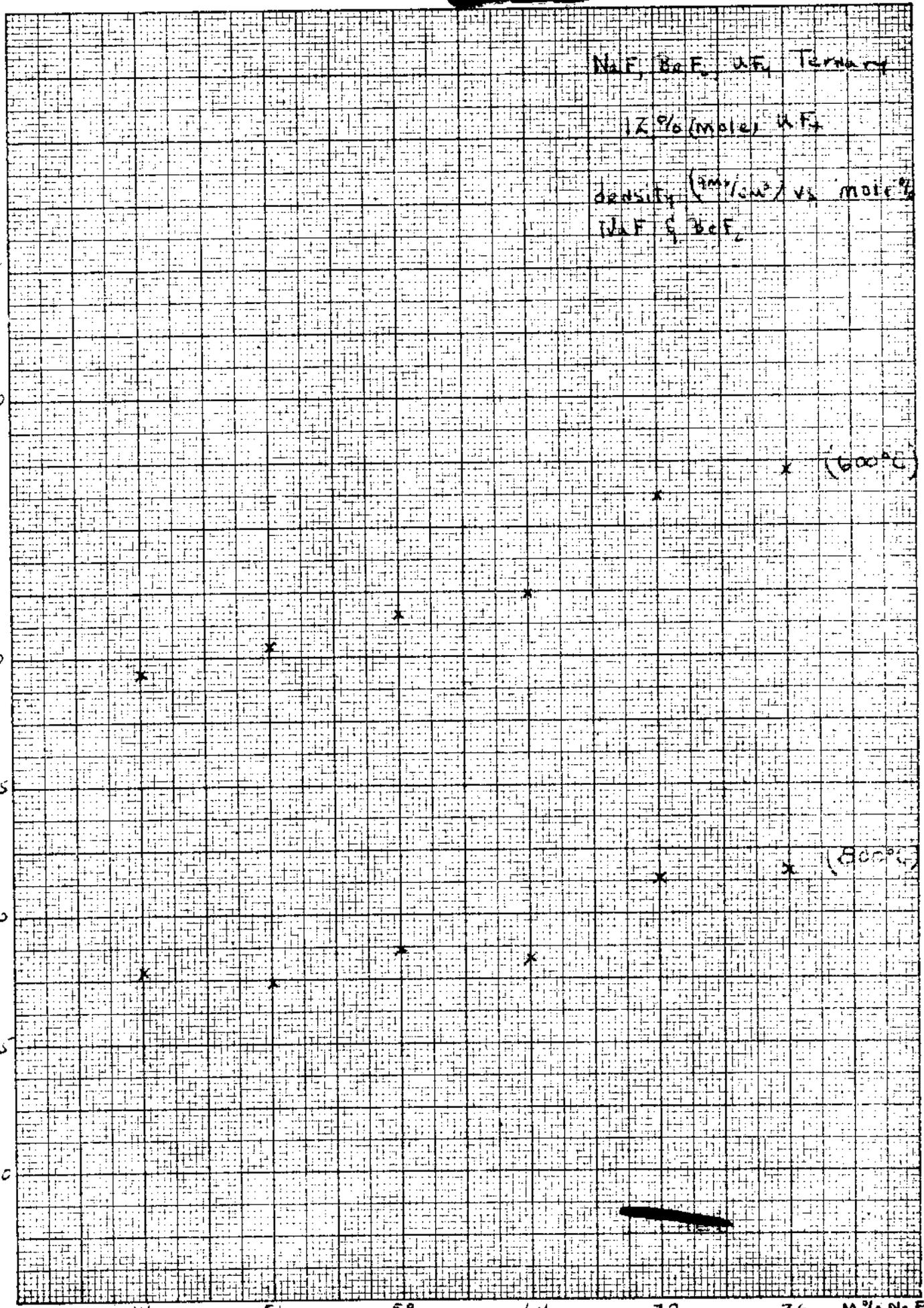
NaF, BeF₂, UF₄ Ternary
1% (mole) UF₄
density (gm/cm³) vs mole %
NaF & BeF₂

(600°C)

(500°C)

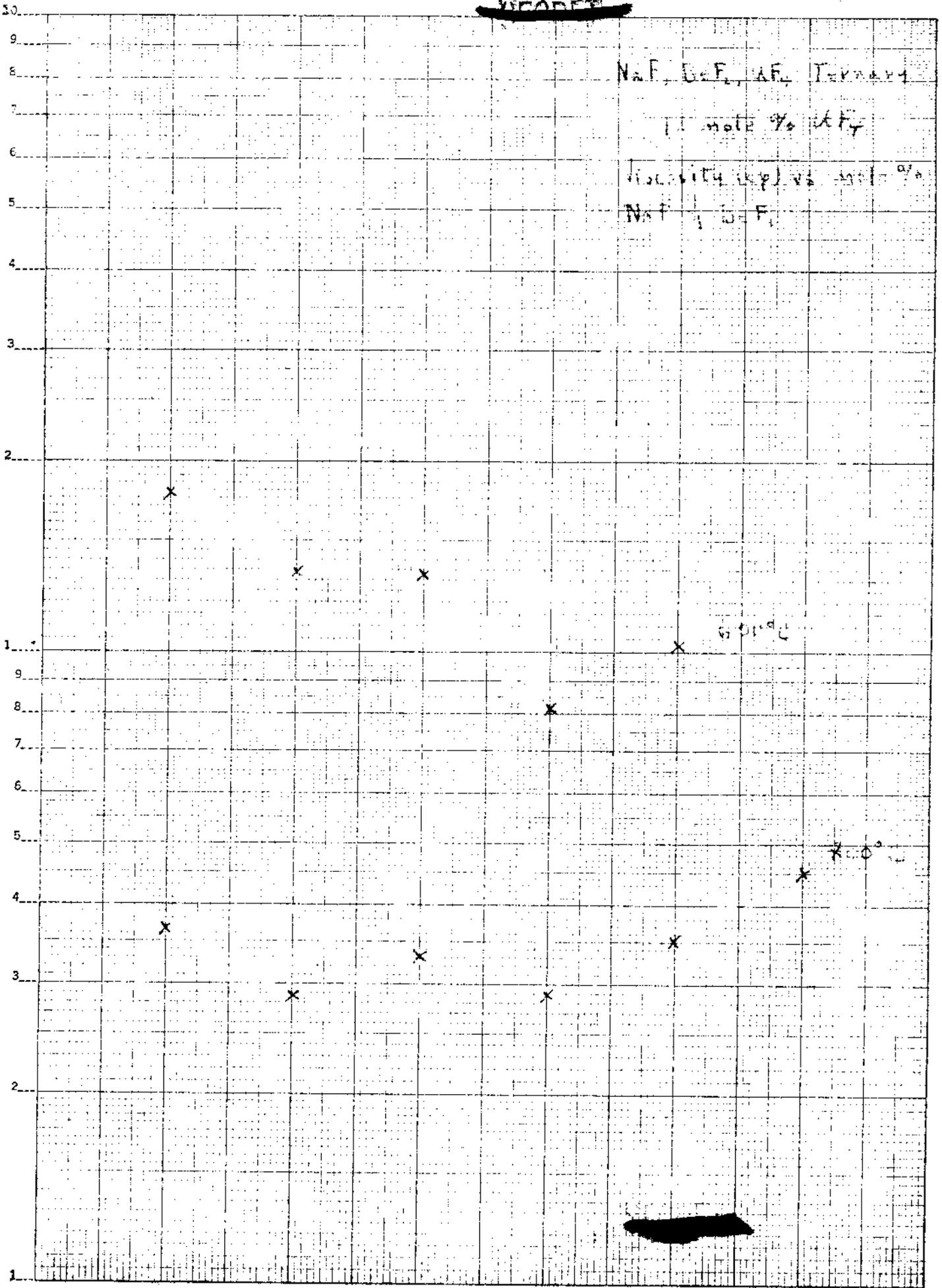
KEUFFEL & ESSER CO., N. Y. NO. 389-11
If > 10 to the 1/2 inch, 3/16 inch available.
Engineering 7 X 10 in.
MADE IN U.S.A.

← M% BeF₂ 46 42 36 58 30 64 70 76 M% NaF →
140/41-18

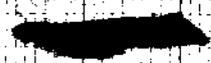


~~SECRET~~

NaF, BeF₂, AlF₃ Ternary
11 mole % AlF₃
viscosity (cp) vs. mole %
NaF, BeF₂



3010 C
KODAK SAFETY FILM
MADE IN U.S.A.



~~SECRET~~ - 42 -

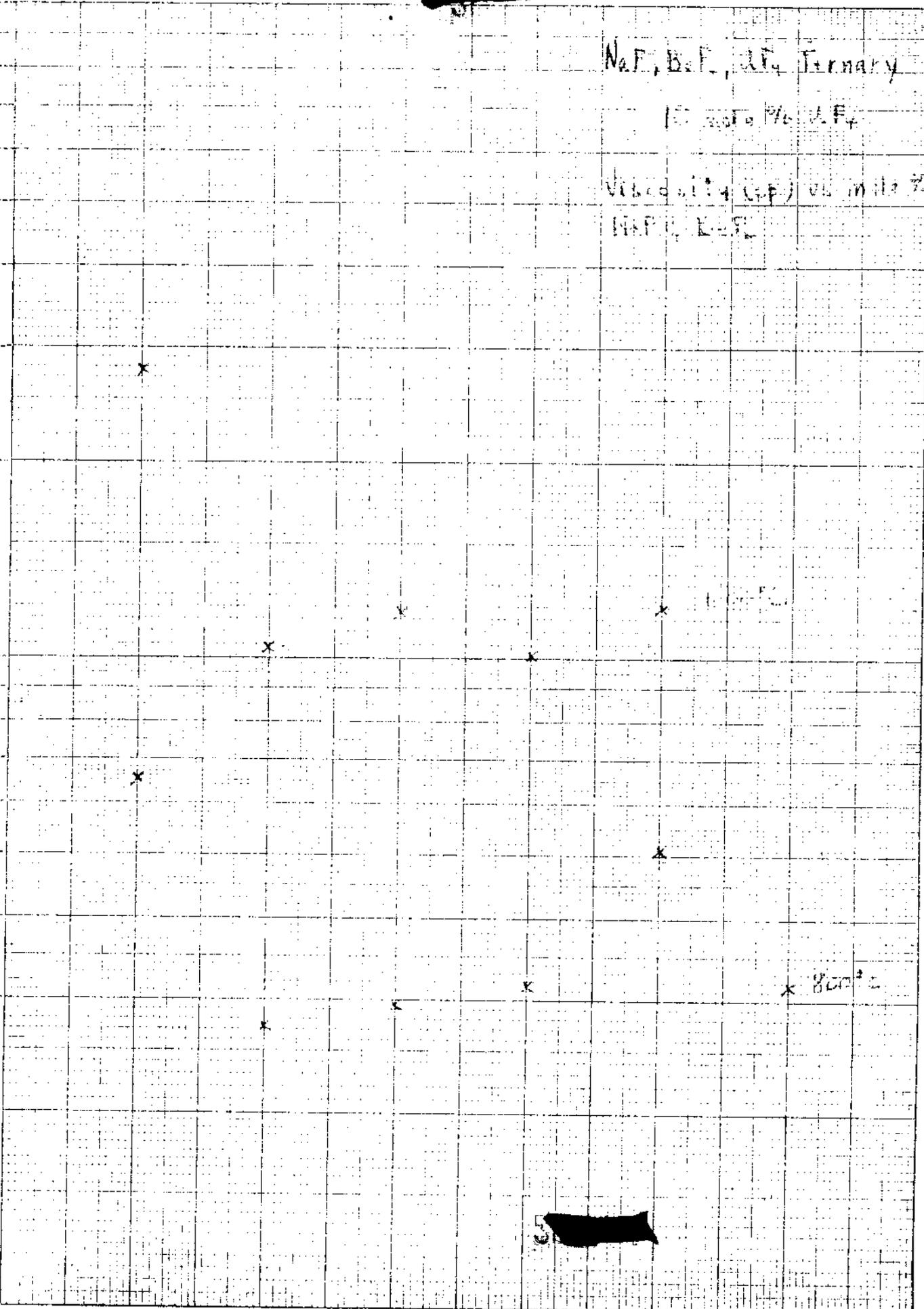
~~SECRET~~

NAP, B&F, 27, February

10 20 30 40 50 60 70 80 90 100

Visibility (ft) vs miles %
NAP, B&F

10
9
8
7
6
5
4
3
2
1
9
8
7
6
5
4
3
2
1



100%

800%

~~SECRET~~

SECRET

359-C7 KROFFEL & ESSER CO.
Scribble Machine, Type 1, P. 2, No. 2
MADE IN U.S.A.

1111

~~SECRET~~

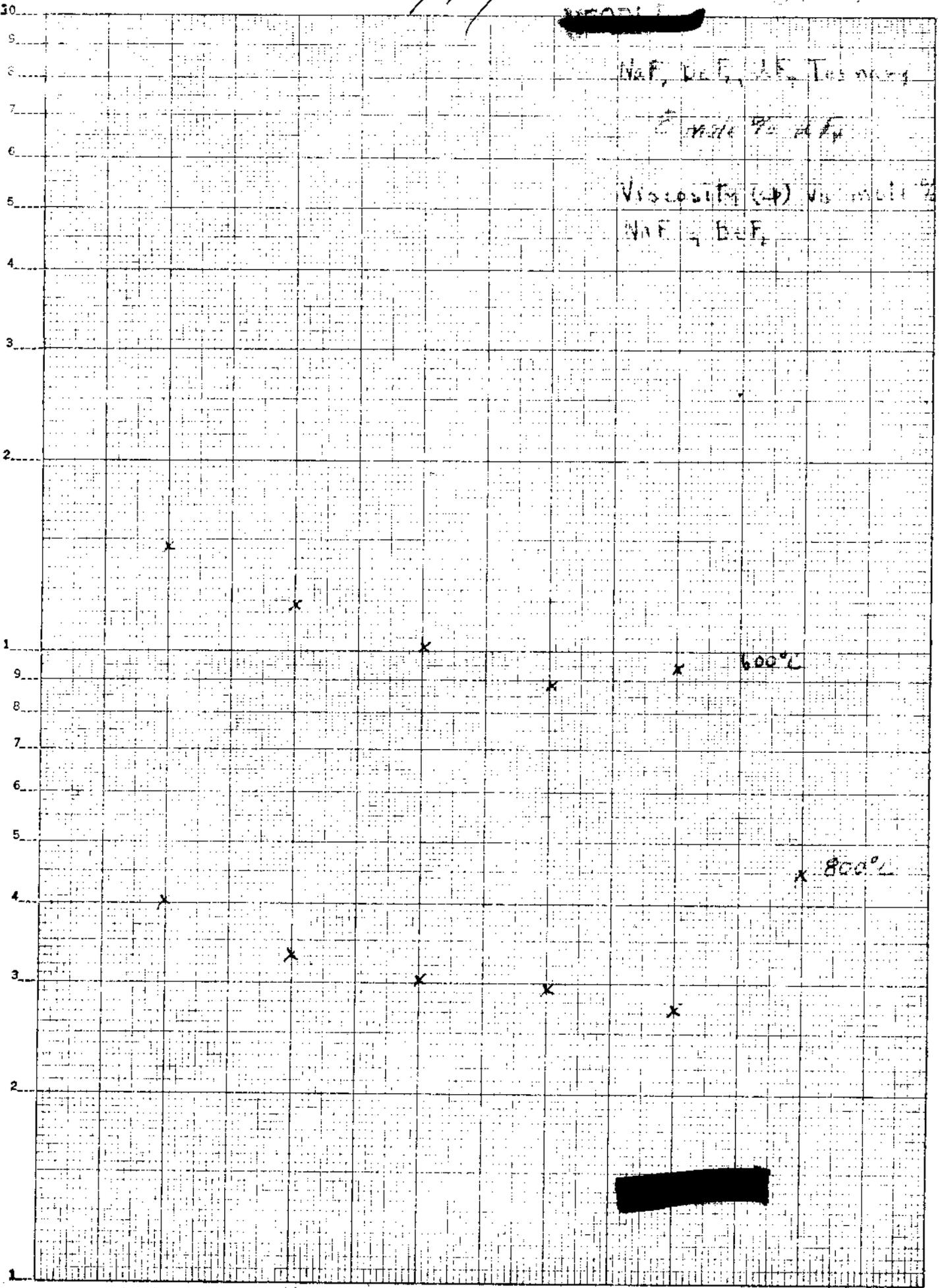
37

NaF, BeF₂, BF₃ Toluene

2 mole % BF₃

Viscosity (cP) vs mole %

NaF, BeF₂



~~SECRET~~

355-61 KEUFFEL & ESSER CO.
7, Madison Avenue, New York 17, N.Y.
MADE IN U.S.A.

det. skt - 44

1/12/7

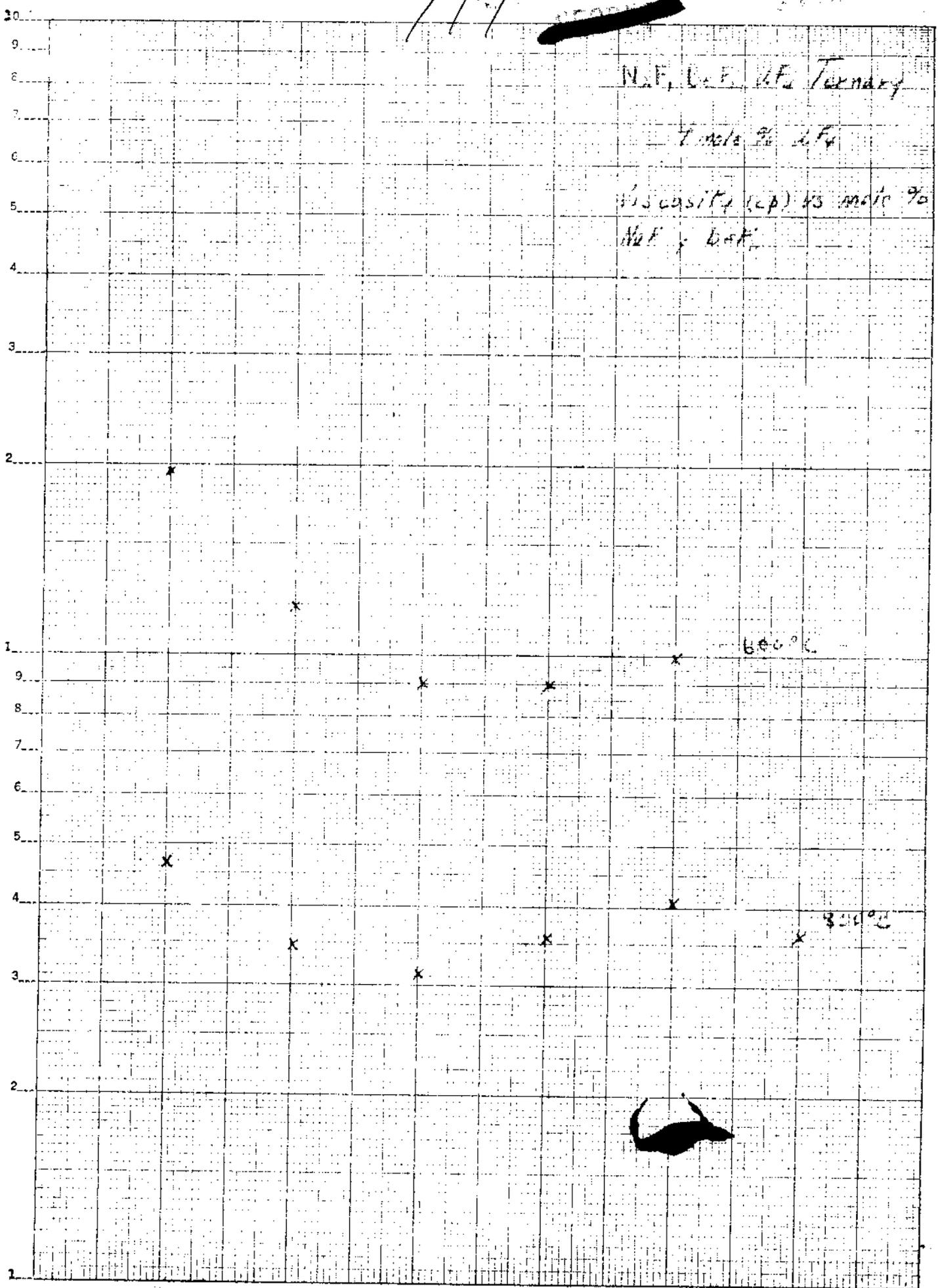
~~SECRET~~

2000

N₂F, O₂F, H₂F Ternary

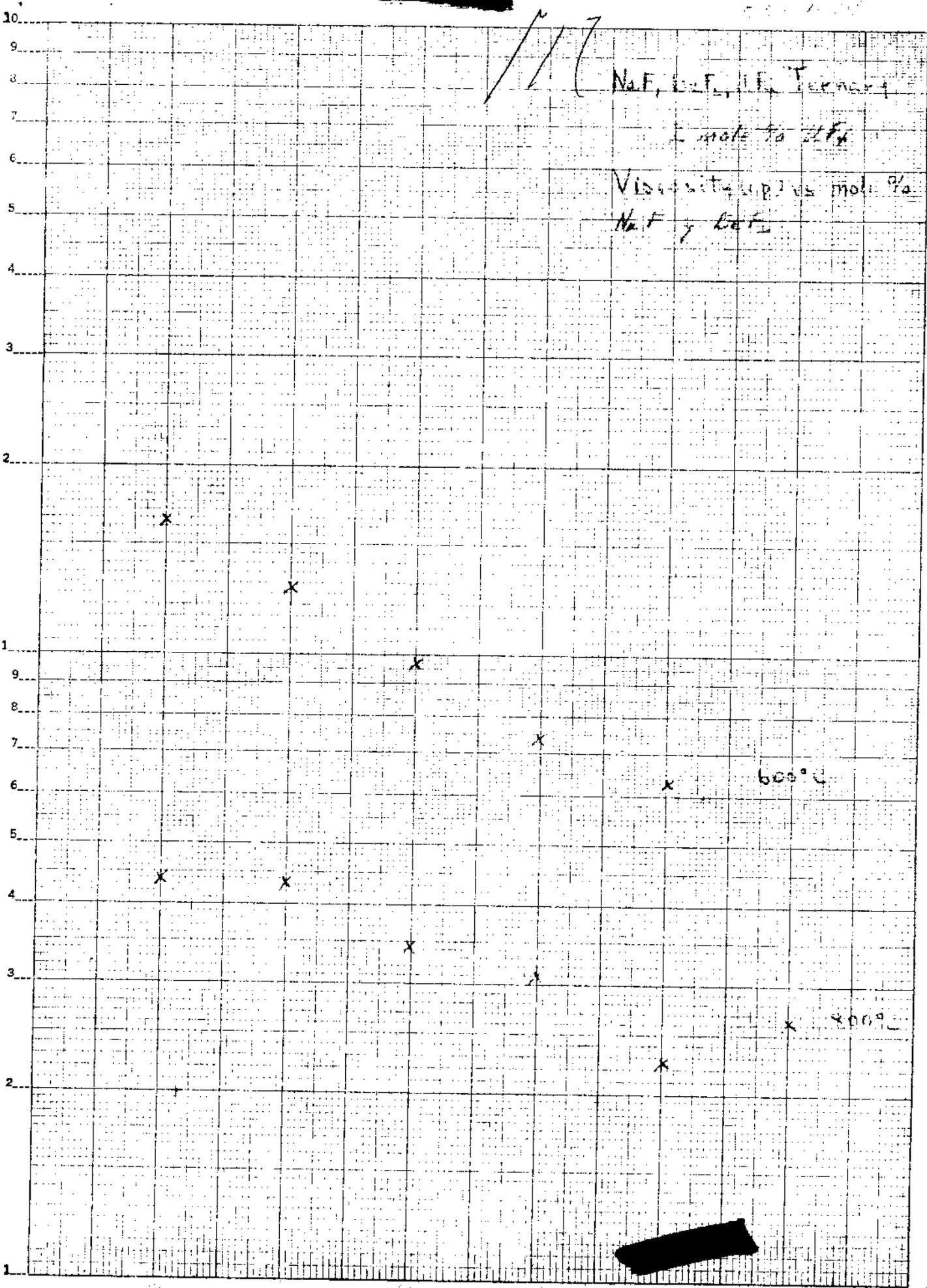
T. mole % H₂F

viscosity (cp) vs mole %
N₂F : O₂F



159 C1 KNUFFEL & ESSER CO.
Semi-Logarithmic Graphs - 19 to 100 x 1 inch.
All lines computer plotted.
MADE IN U.S.A.

SECRET-46-



159-61 KUFFEL & ESSER CO.
 2100 E. 1st St. - 1000 Taylor St. - 1000
 Chicago, Ill. - 1000 Taylor St. - 1000
 MADE IN U.S.A.

Sheet - 47 -

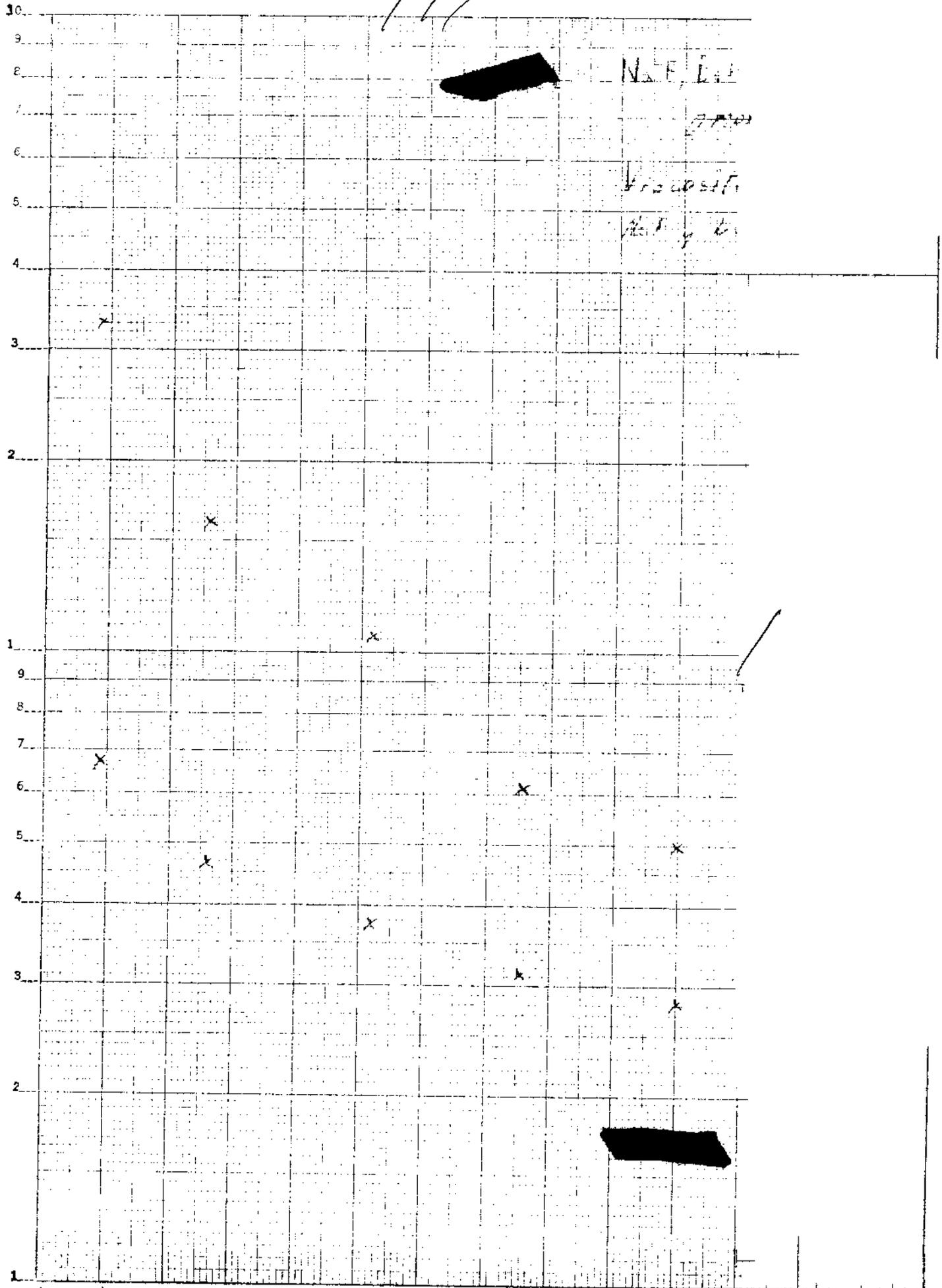
11/3

N.E. 1st

7/10/00

1200515

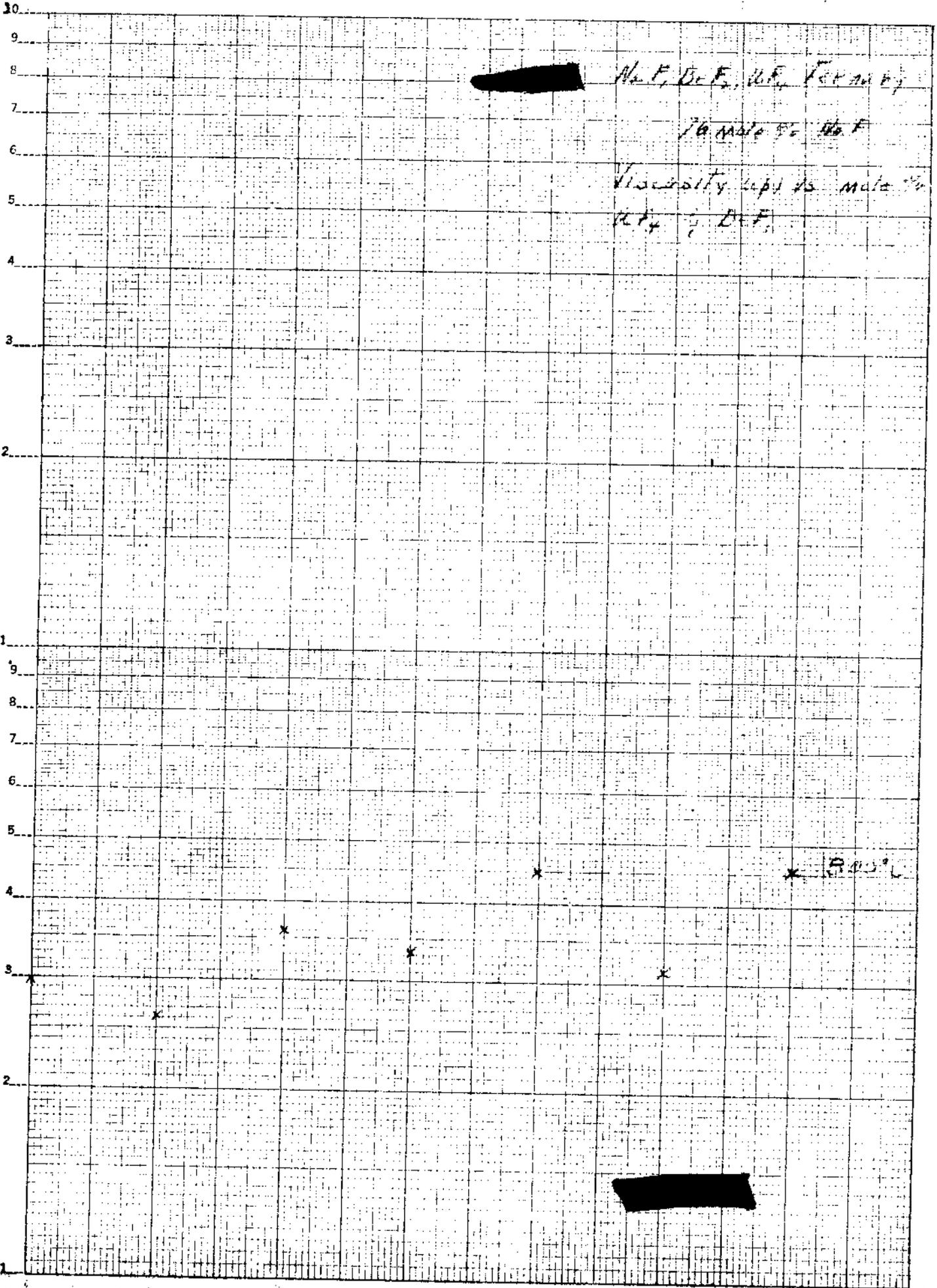
11/1/00



2006 KOUFFEL & ESSER CO.
 24 pages 29 to the 100th
 11/1/00
 MADE IN U.S.A.

11/1/00

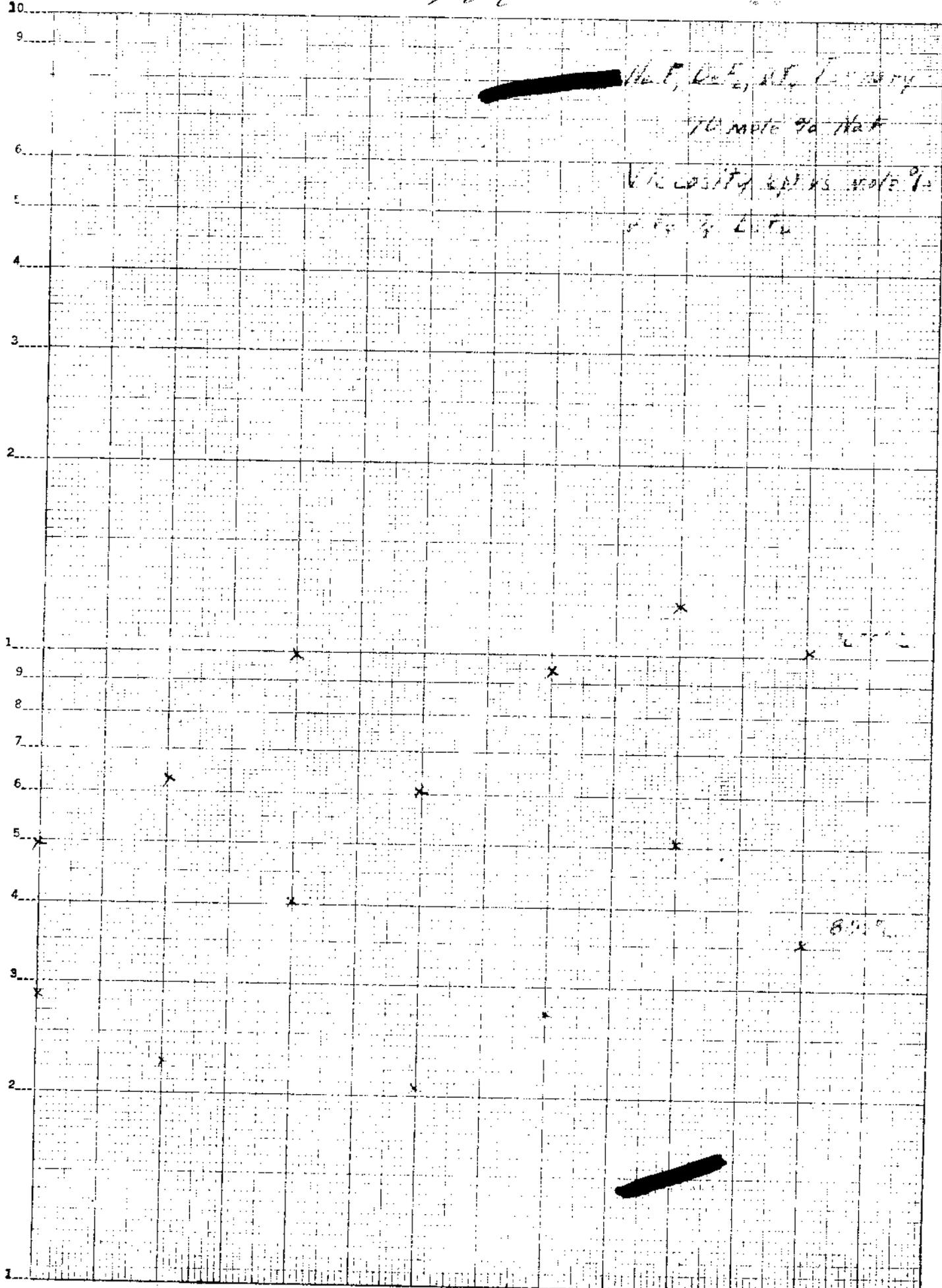
359-63 KEUFFEL & ESSER CO.
Semi-Logarithmic, 2 Cycles X by 10 the Y_2 inch.
5th. (This is corrected.)
MADE IN U. S. A.



80

1000-1000

100



350 CT
 KEUFEL & ESSER CO.
 Some Low-Vis. Ink. 2 Colors. In. or 1/2 in. 1 inch.
 2 1/2 lines wide grid
 MADE IN U.S.A.

100-50-

111

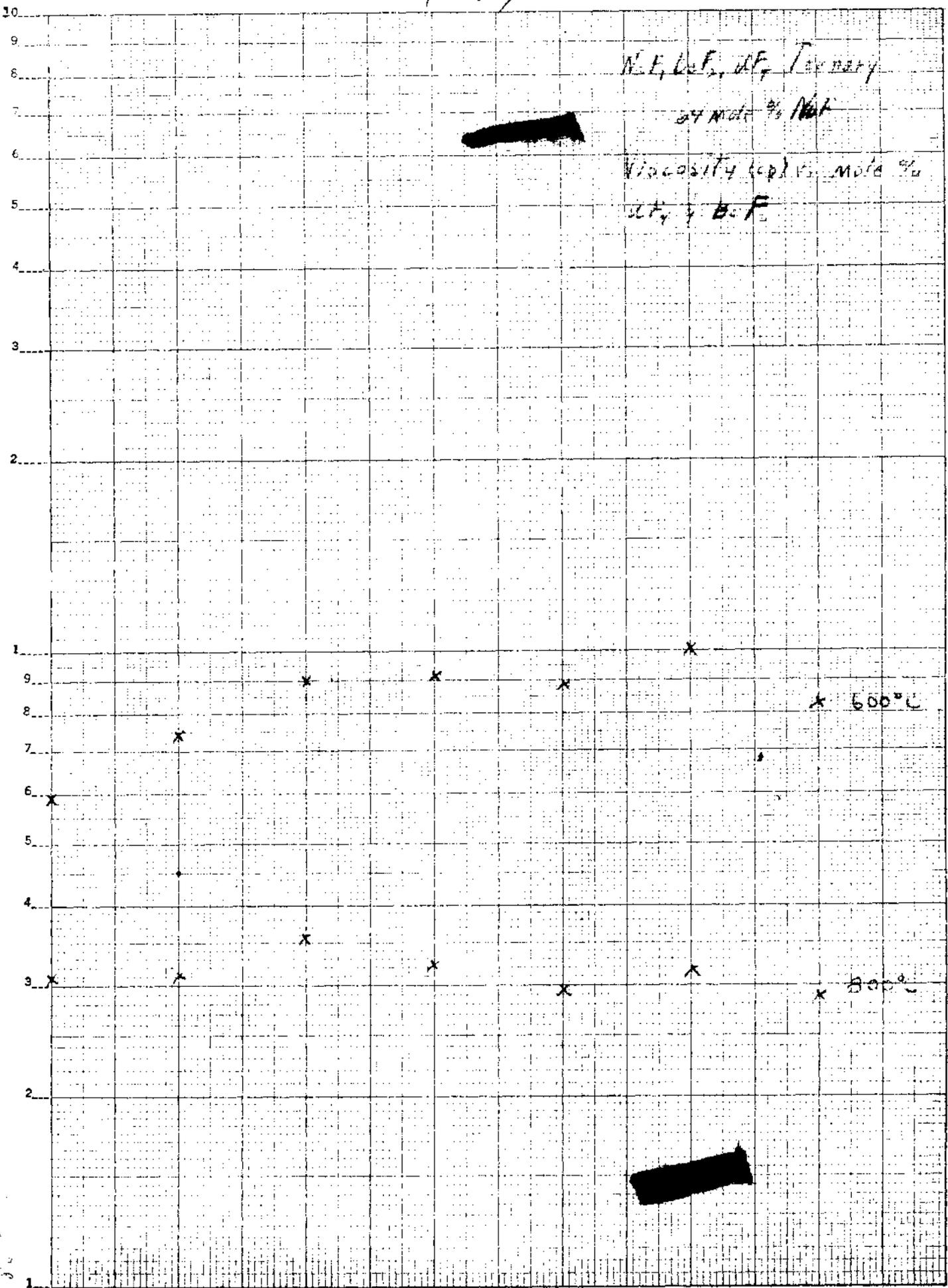
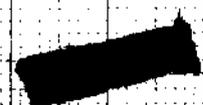
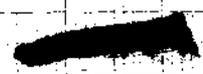
16-10-1941

W.F., CaF_2 , AlF_3 Ternary

at mole % NaF

Viscosity (cp) vs. mole %

AlF_3 & B_2O_3



754-67 KEUFFEL & ESSER CO.
 Semi-Logarithmic Plot System - 16 to 100 on X-axis,
 with lines as printed
 Model B-10-A

10/10/41

1111

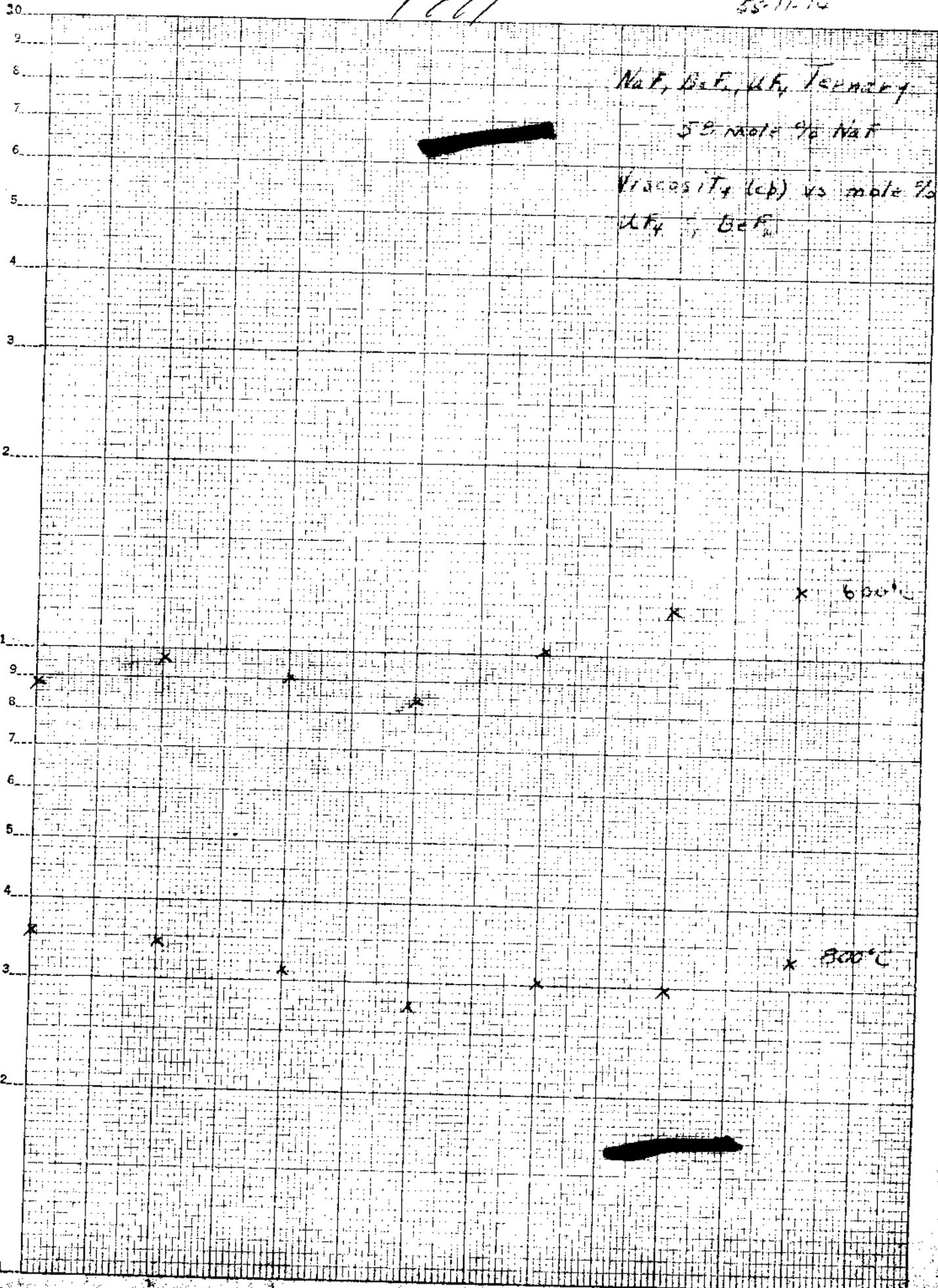
55-11-14

NaF, B₂F₆, UF₆ Ternary

59 mole % NaF

Viscosity (cp) vs mole %

UF₆, B₂F₆



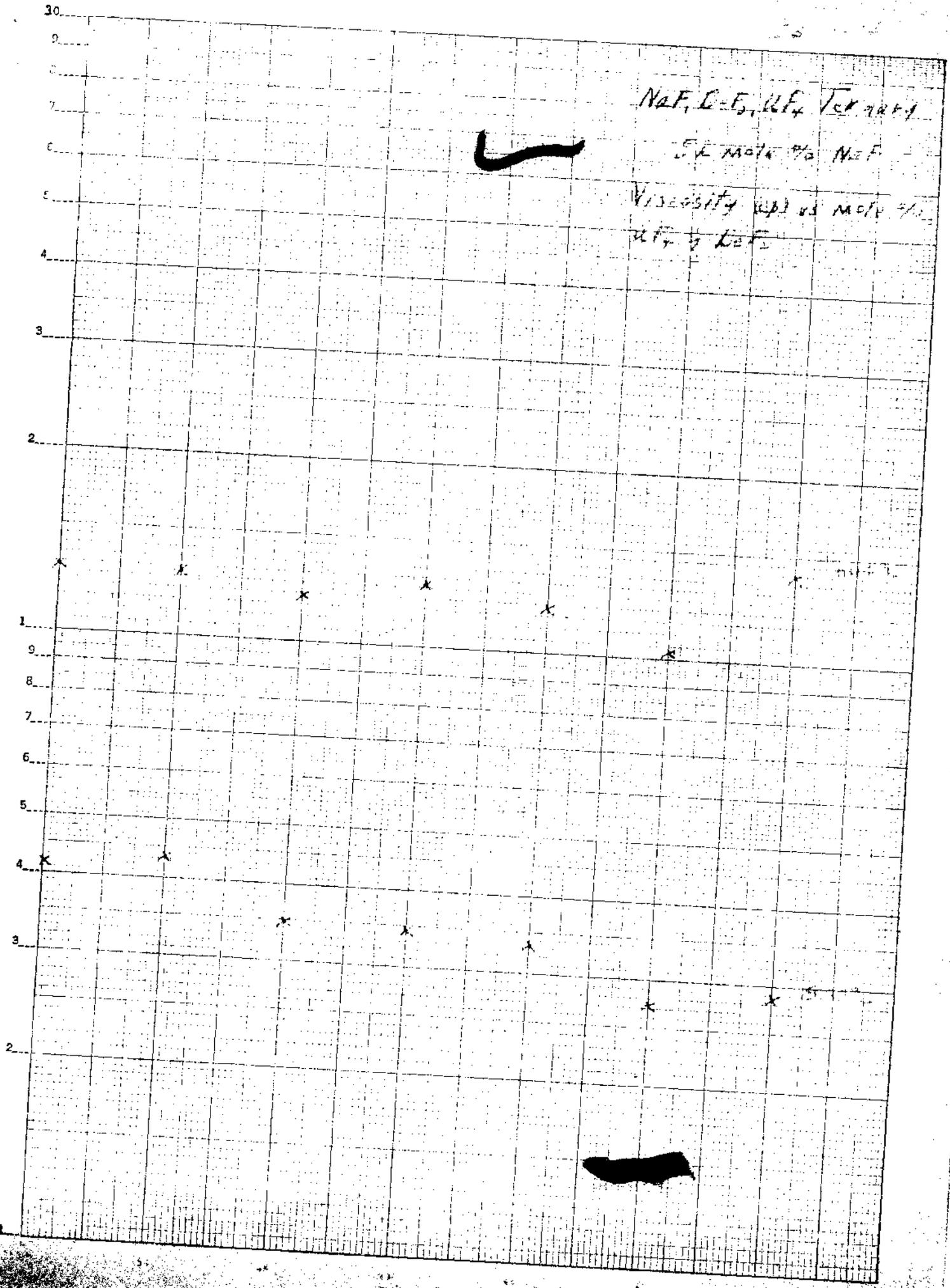
359-67 KEUFFEL & ESSER CO.
Semi-Logarithmic, 2 Cycle, 19 to the 10 inch,
500 lines spaced.
MADE IN U.S.A.

Sheet 52

NAF, C-E₂, UF₄ Tcr 2004

5% mole % NAF

Viscosity (cp) vs mole %
UF₄ & C-E₂



KEUFFEL & ESSER CO.
Chicago, Ill.
MADE IN U.S.A.

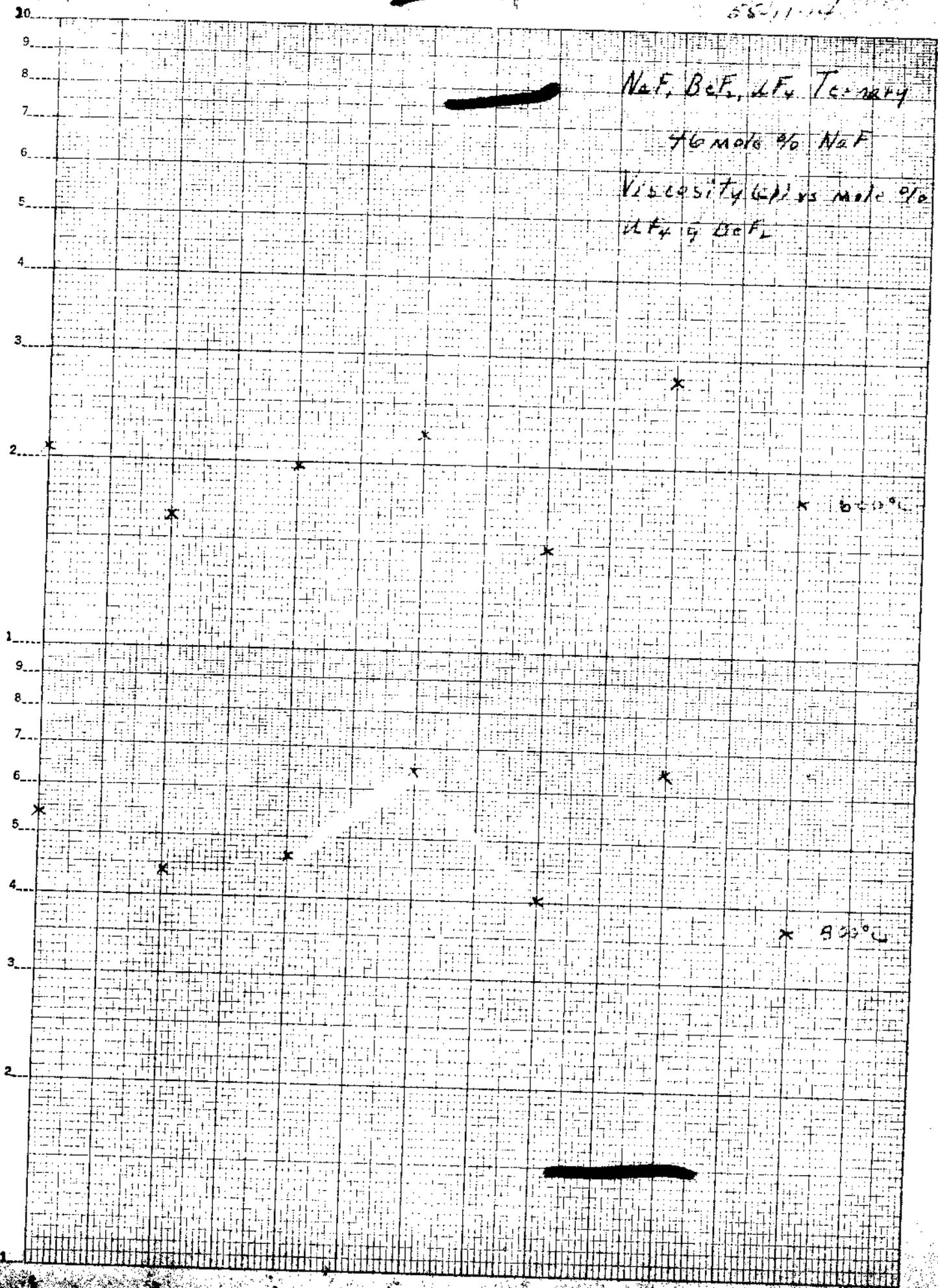
55-11-11

NaF, BeF₂, LiF Ternary

76 mole % NaF

Viscosity (cp) vs mole %

LiF of BeF₂



350-63 KEUFFEL & ESSER CO.
Semi-Logarithmic, 2 1/2 x 3 1/2 in. to the 1/2 in.
with lines included.
MADE IN U.S.A.

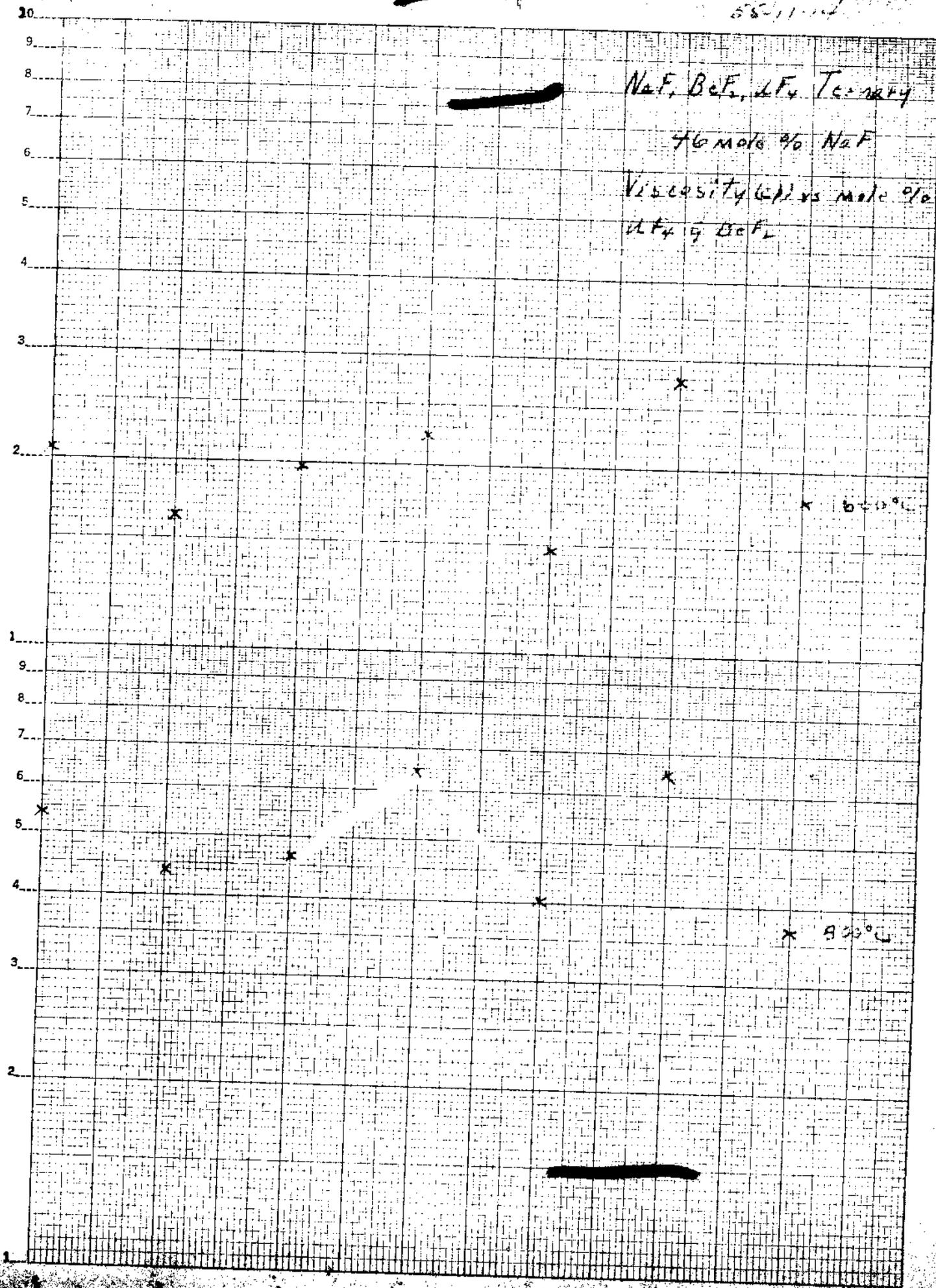
54

55-11-11

NaF, BeF₂, LiF Ternary

76 mole % NaF

Viscosity (cp) vs mole %
LiF or BeF₂



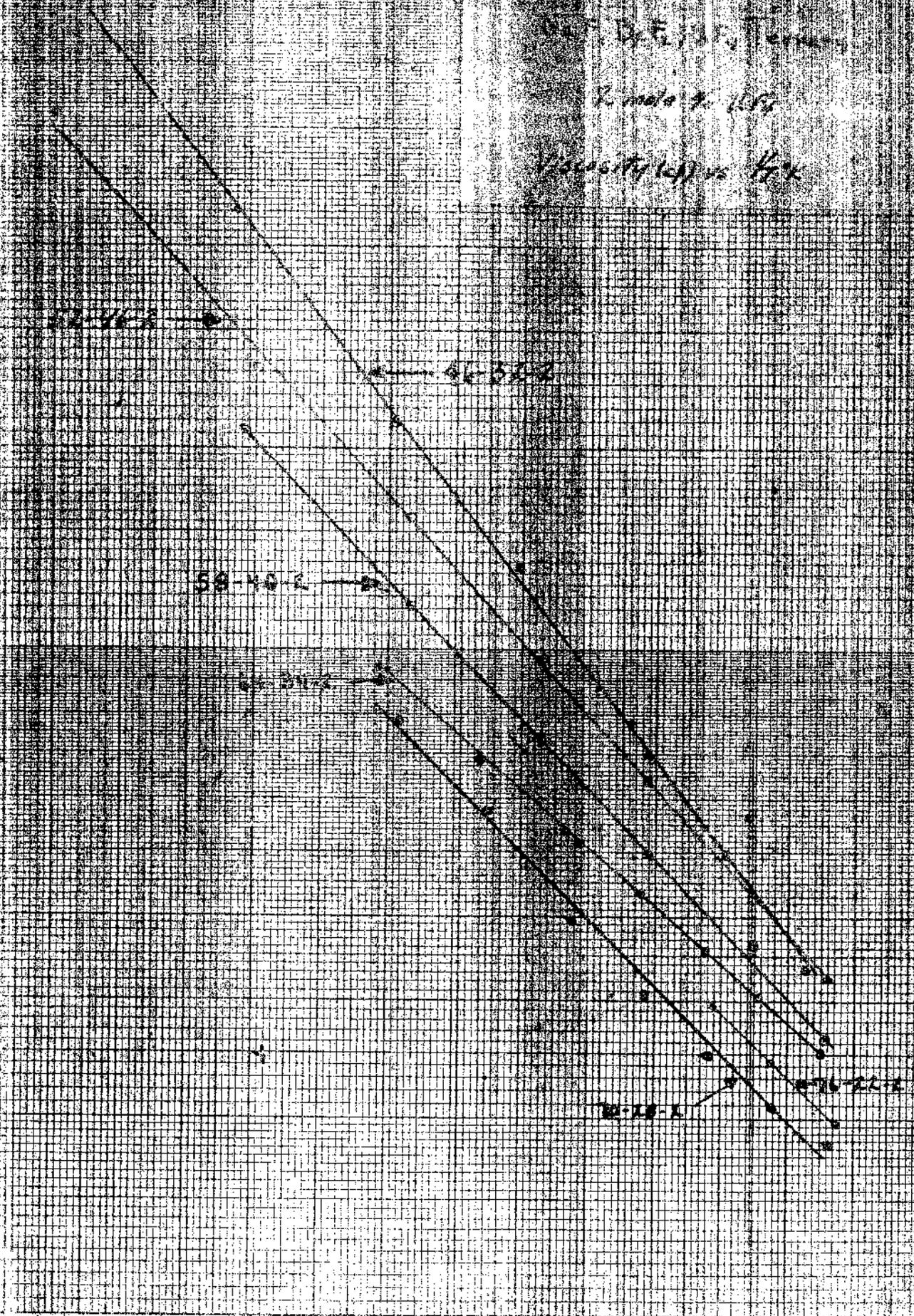
350-63 KEUFFEL & ESSER CO.
Semi-Logarithmic, 2 1/2" x 3 1/2" to the 1/2" inch.
with lines included.
MADE IN U.S.A.

54

7-30-11-17

GEURE

Dr. E. J. ...
...
...



$K \times 10^{-2}$

50

5-11



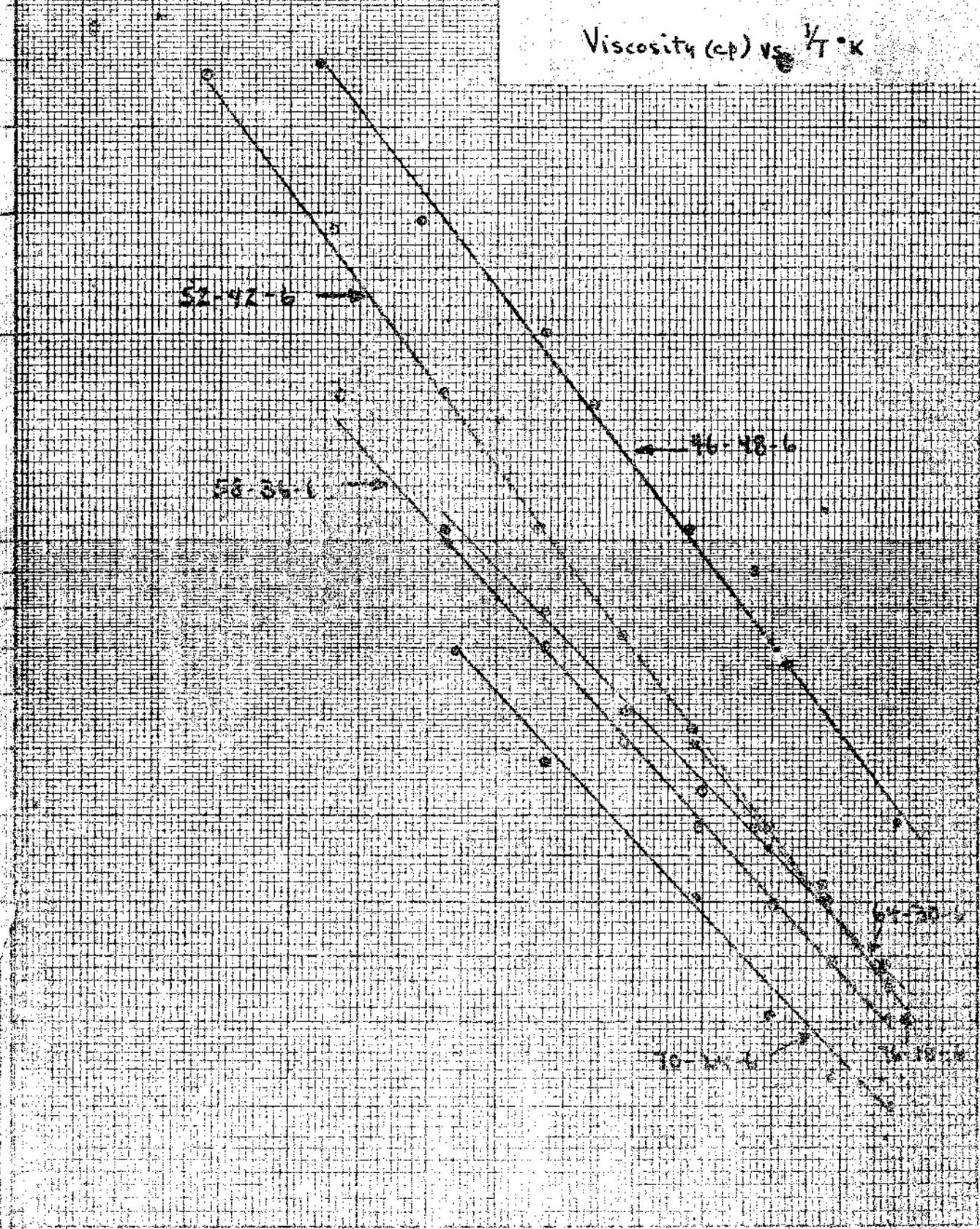
Vertical text on the right side of the strip, possibly bleed-through from the reverse side of the page. The text is mostly illegible due to the smudge and low resolution, but some words like 'The' and 'of' are faintly visible.

SECRET

NaF, BeF₂, UF₄ Ternary

6 mole % UF₄

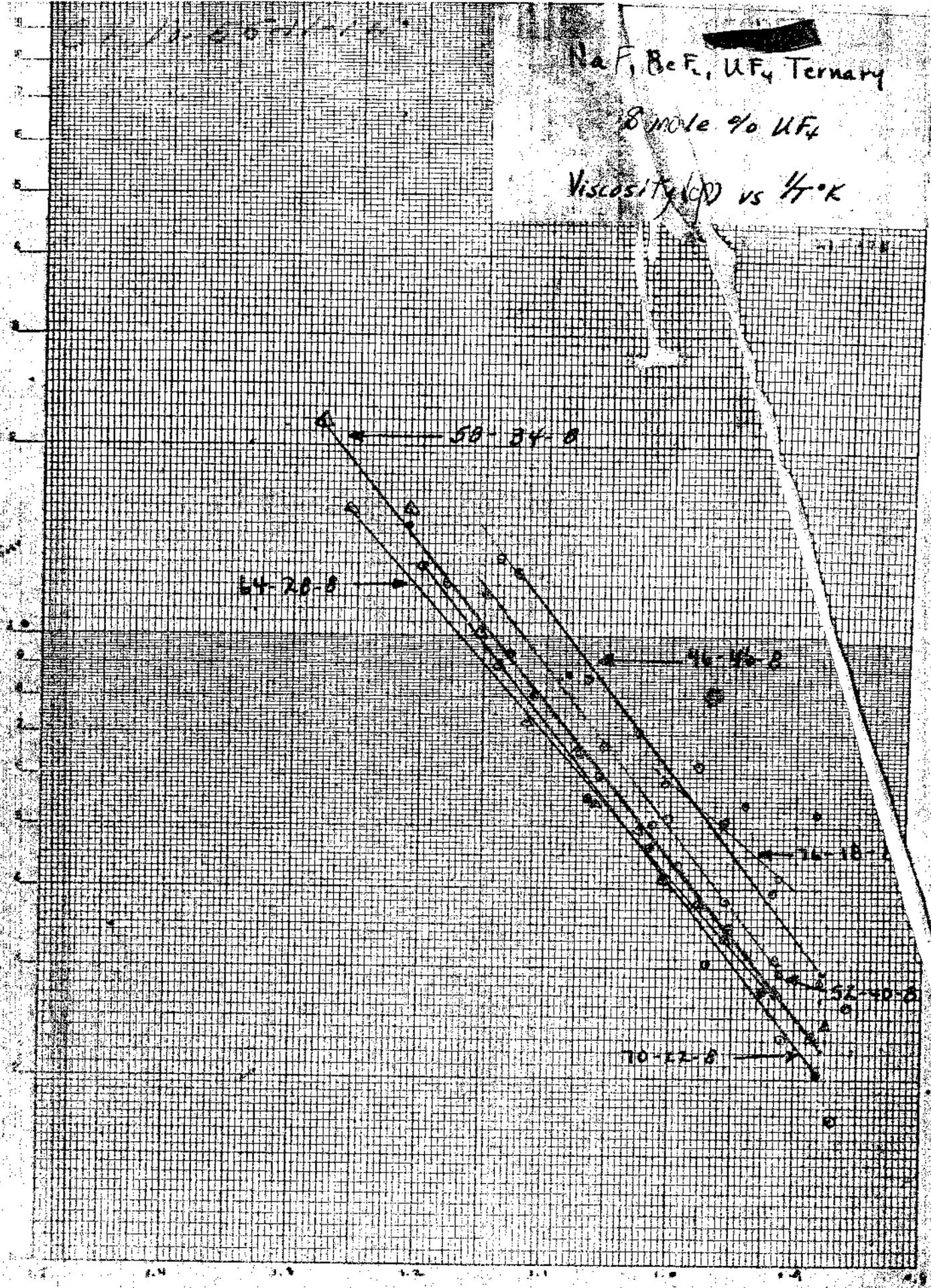
Viscosity (cp) vs. $1/T \cdot K$



NaF, BeF₂, UF₄ Ternary

8 mole % UF₄

Viscosity (CP) vs $1/T \cdot K$

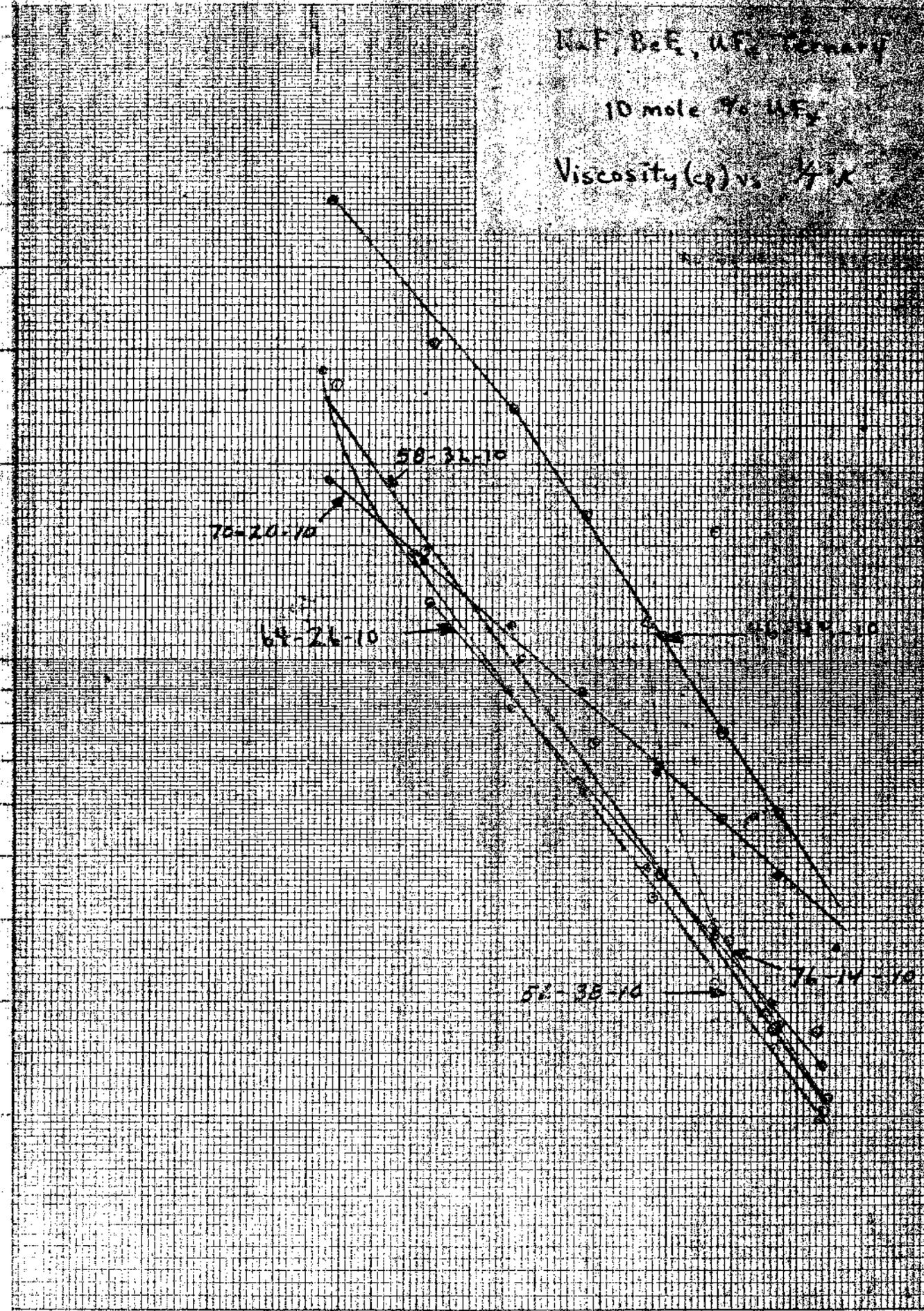


$1/T \times 10^3 \text{ } ^\circ K$
-58-

35-11-17

~~SECRET~~

NaF, BeE, UF₆ Ternary
10 mole % UF₆
Viscosity (cp) vs. T (K)

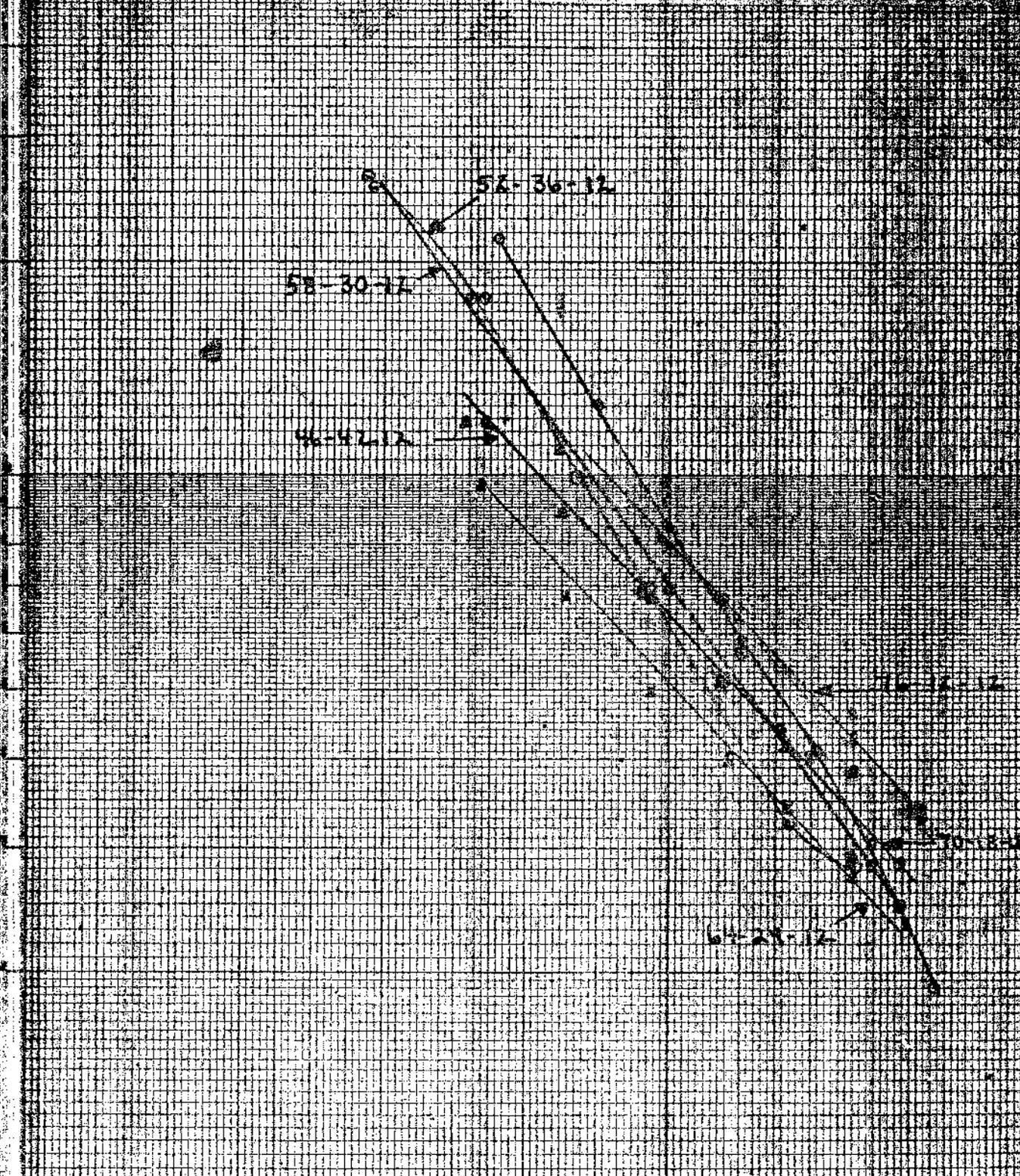


1.5 1.4 1.3 1.2 1.1 1.0 0.9 0.8

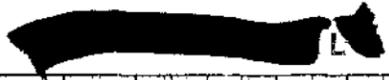
UP 53-11-74

FIGURE

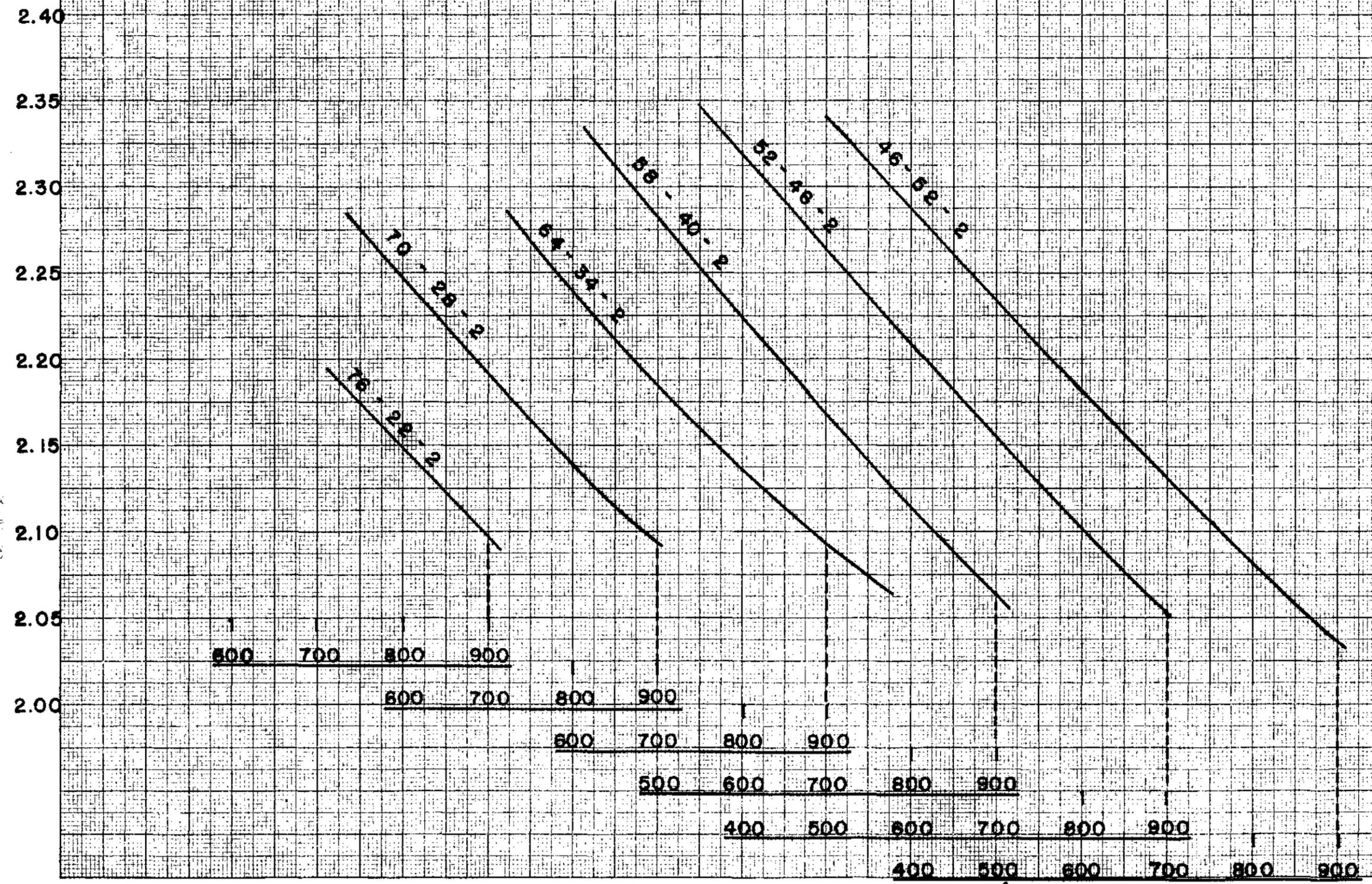
NaF, 30F, 40F, 50F
12 mole % NaF
Viscosity (cp) vs $\sqrt{r/k}$



1.4 1.3 1.2 1.1 1.0 0.9 0.8
 10^4 SEEDS



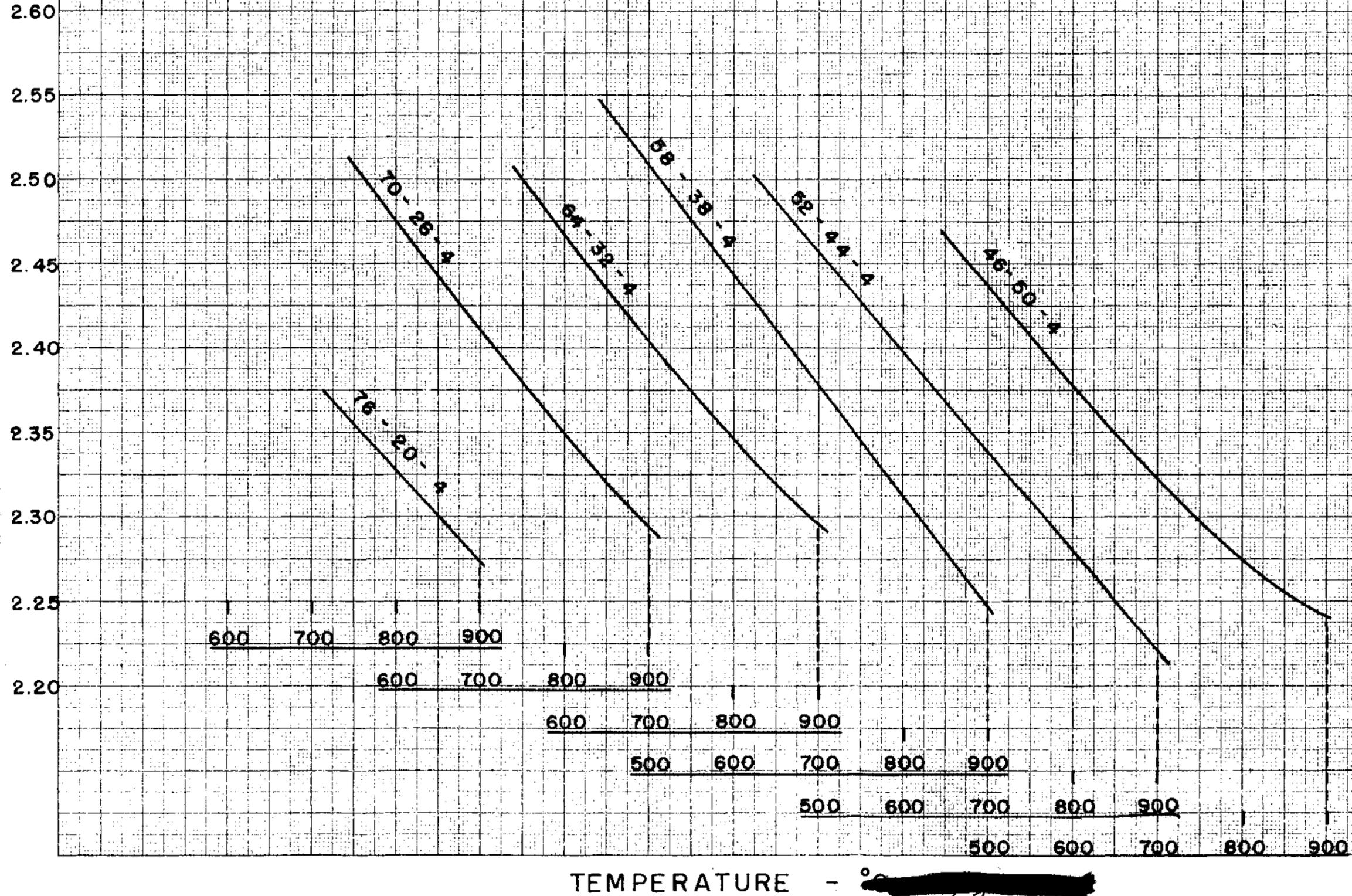
DENSITIES OF 2 MOLE % UF₆ TERNARY MIXTURES



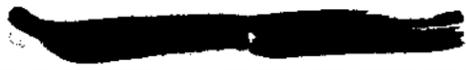
KEUFFEL & ESSER CO. N. Y. NO. 55-11-14
Millimeter, 3 mm. tubes mounted on brass base.

TEMPERATURE - °C

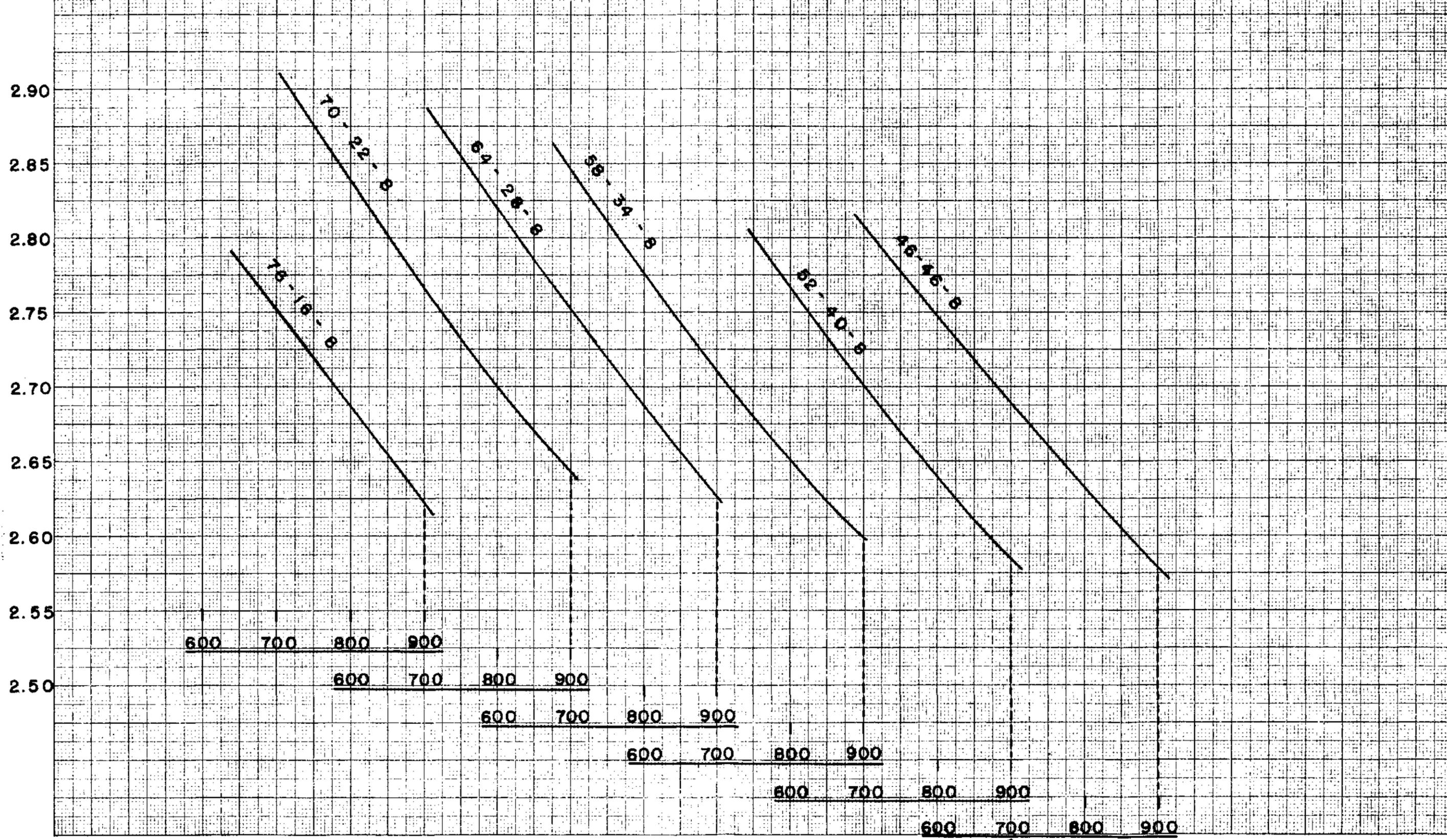
DENSITIES OF 4 MOLE % UF_4 TERNARY MIXTURES



KEUFFEL & ESSER CO. N. Y. NY. JUNE 1955

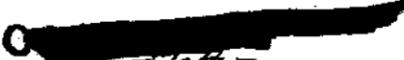


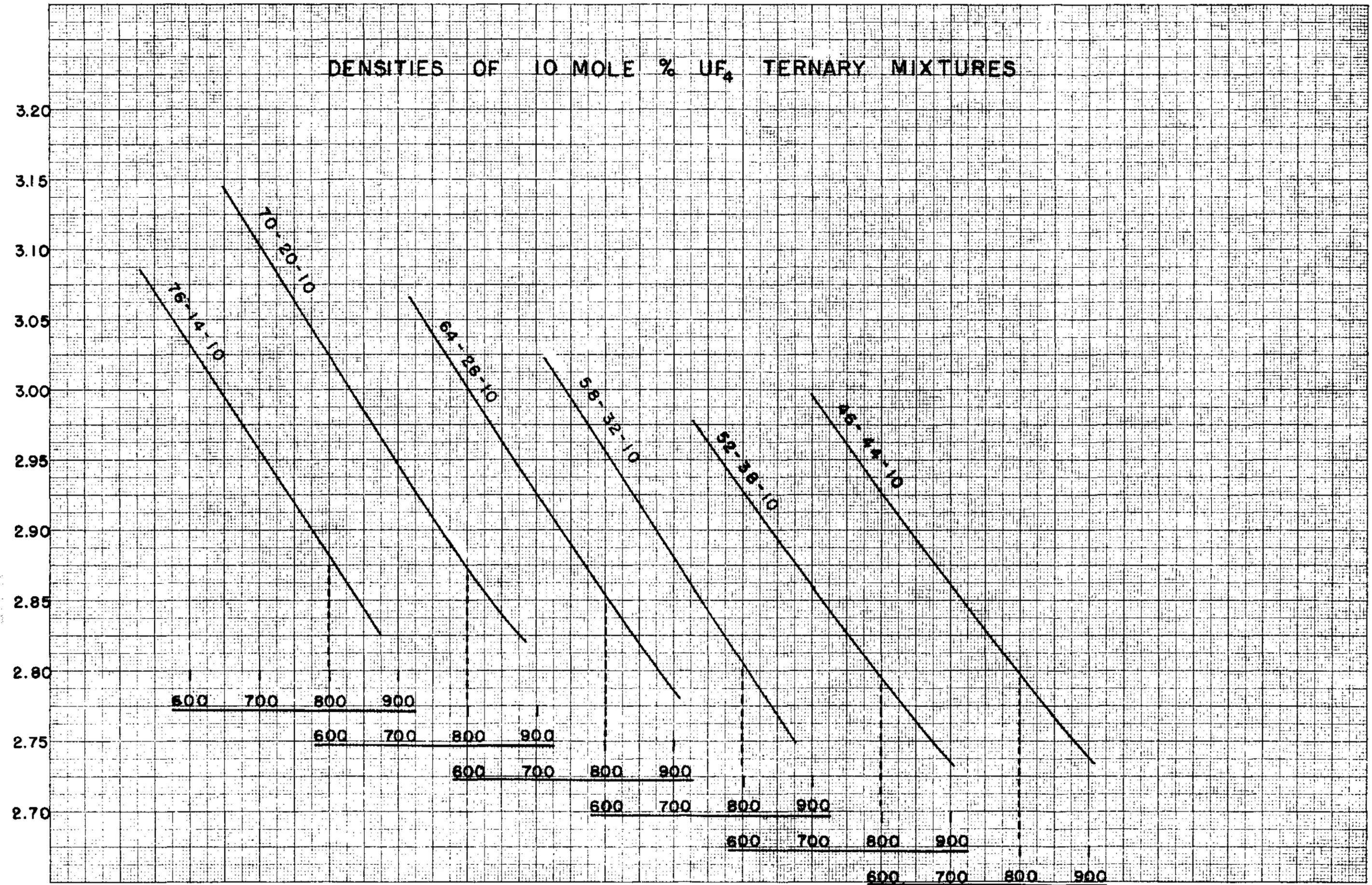
DENSITIES OF 8 MOLE % UF_4 TERNARY MIXTURES



KAUFFEL & ESSER CO. N. Y. NO. 55-11-14
Manufactured in the United States of America

TEMPERATURE — °C





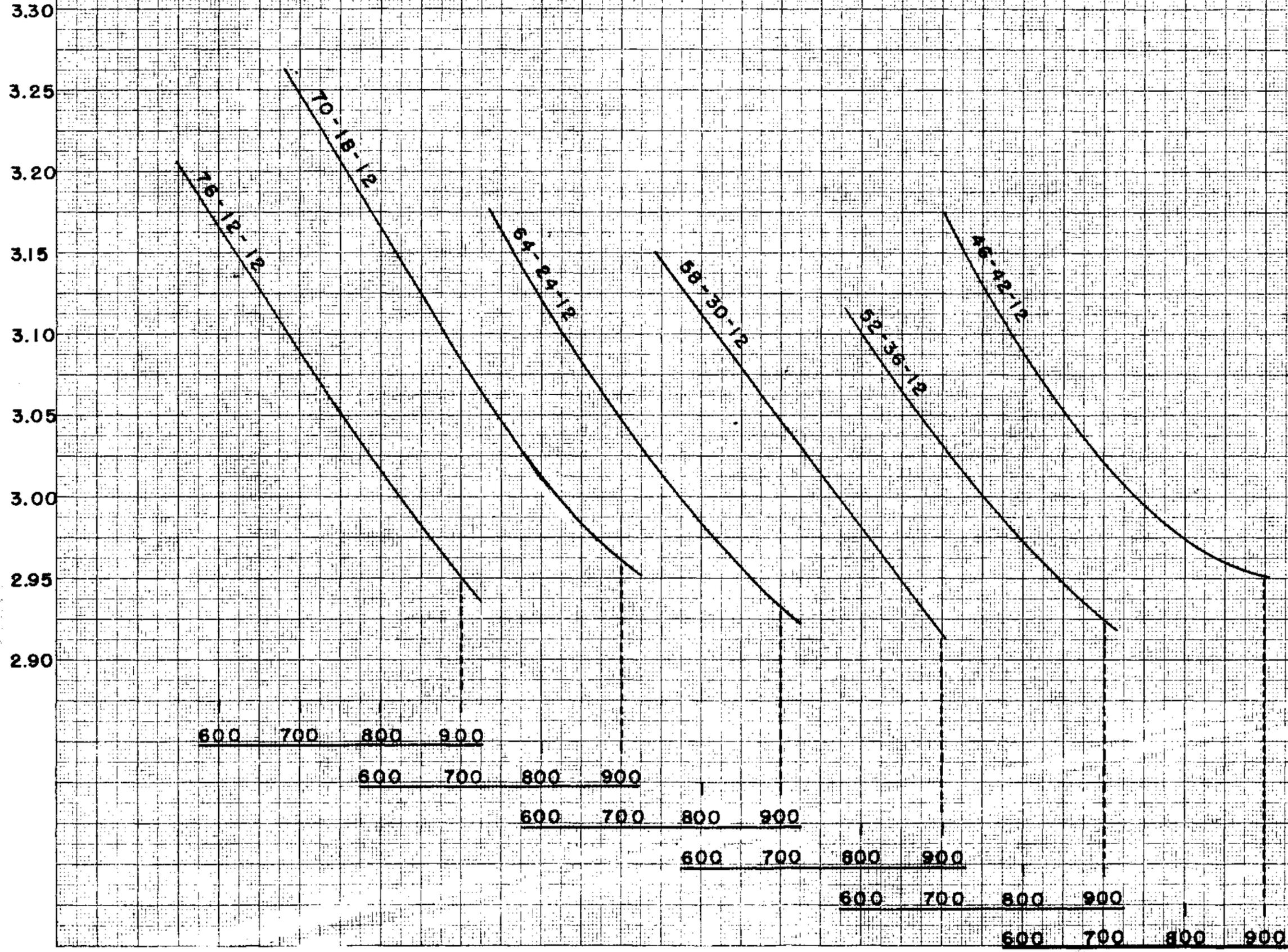
KEUFFEL & ESSNER CO., N. Y. NO. 750-1414
 Manufactured in U.S.A.

TEMPERATURE - °C

-65-

C.F. No 55-11-14

DENSITIES OF 12 MOLE % UF_4 TERNARY MIXTURES



TEMPERATURE — °C

KRUPP & ESSER CO. N. Y. NO. 36-12-16
Manufacturing Division