



**State Research Institute
of Organic Chemistry
and Technology
(GosNIIOKhT)**

Moscow, Russia

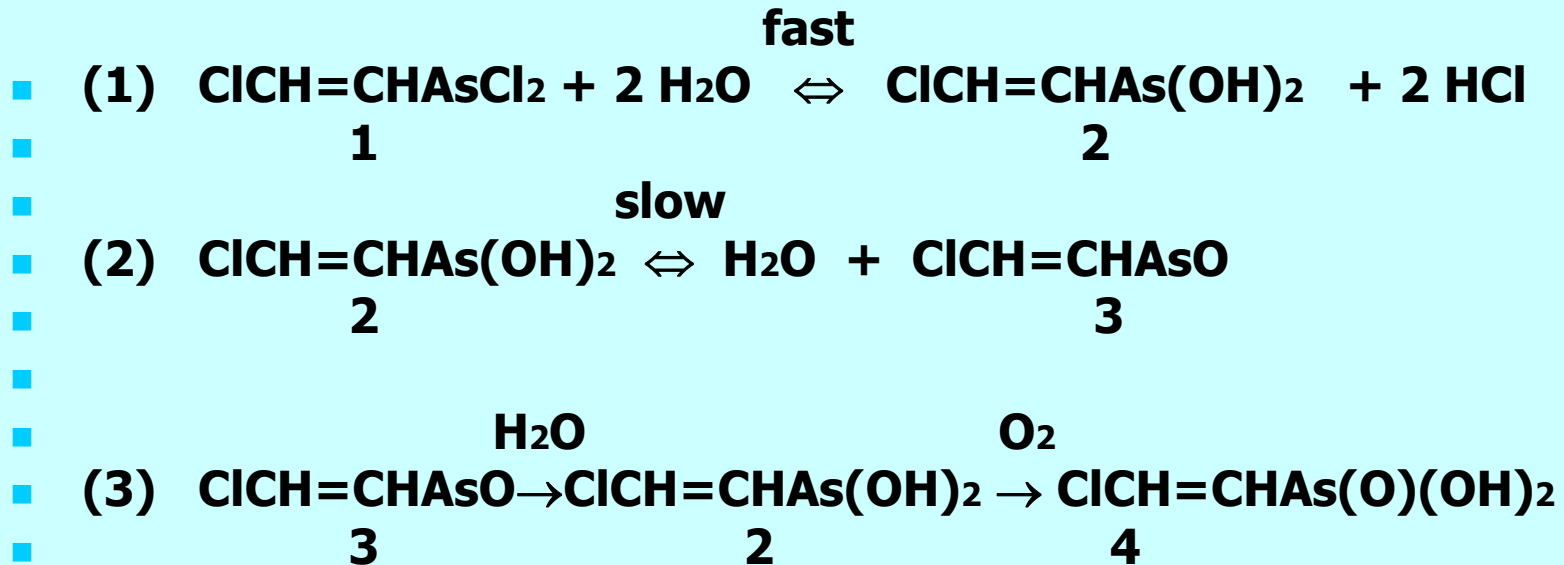
**IDENTIFICATION OF LEWISITE
AND ITS DEGRADATION PRODUCTS
IN ENVIRONMENT USING FTIR
SPECTROSCOPY**

**O.G. Strukov, V.B. Kondrat'ev,
D.Yu. Zalepugin, Z.V. Vlasova,
L.A. Serokhvostova, E.A. Fokin, S.N. Shokin**

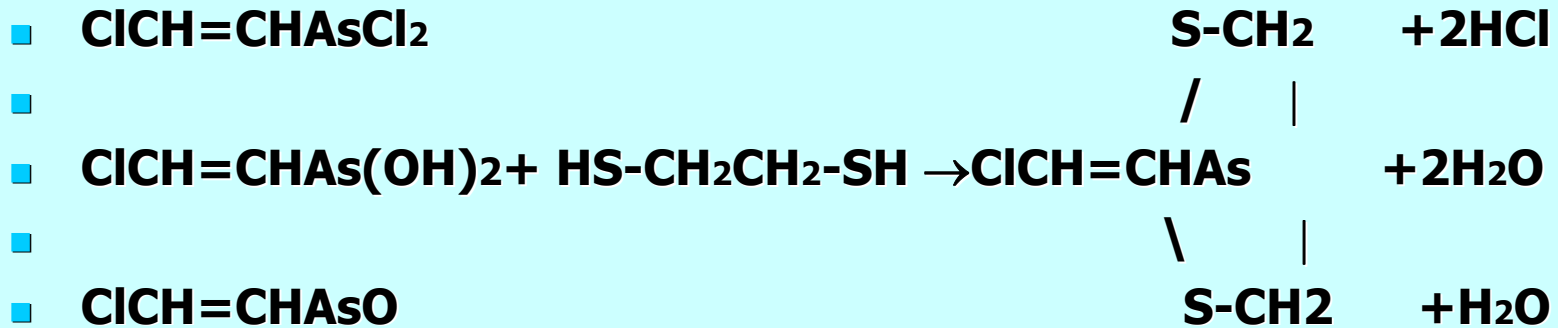
**IR-Fourier Spectrometers:
Middle Infrared Spectra (MIR) in range
4000-350 cm⁻¹
Nicolet Avatar-360**

Liquid samples were studied in cells with windows made of KBr with a path length of 0.1 mm. IR spectra of solid samples were obtained with use of translucent pellet or as thin films applied onto a salt plate.

Interaction of 2-Chlorovinylidichloroarsine with water



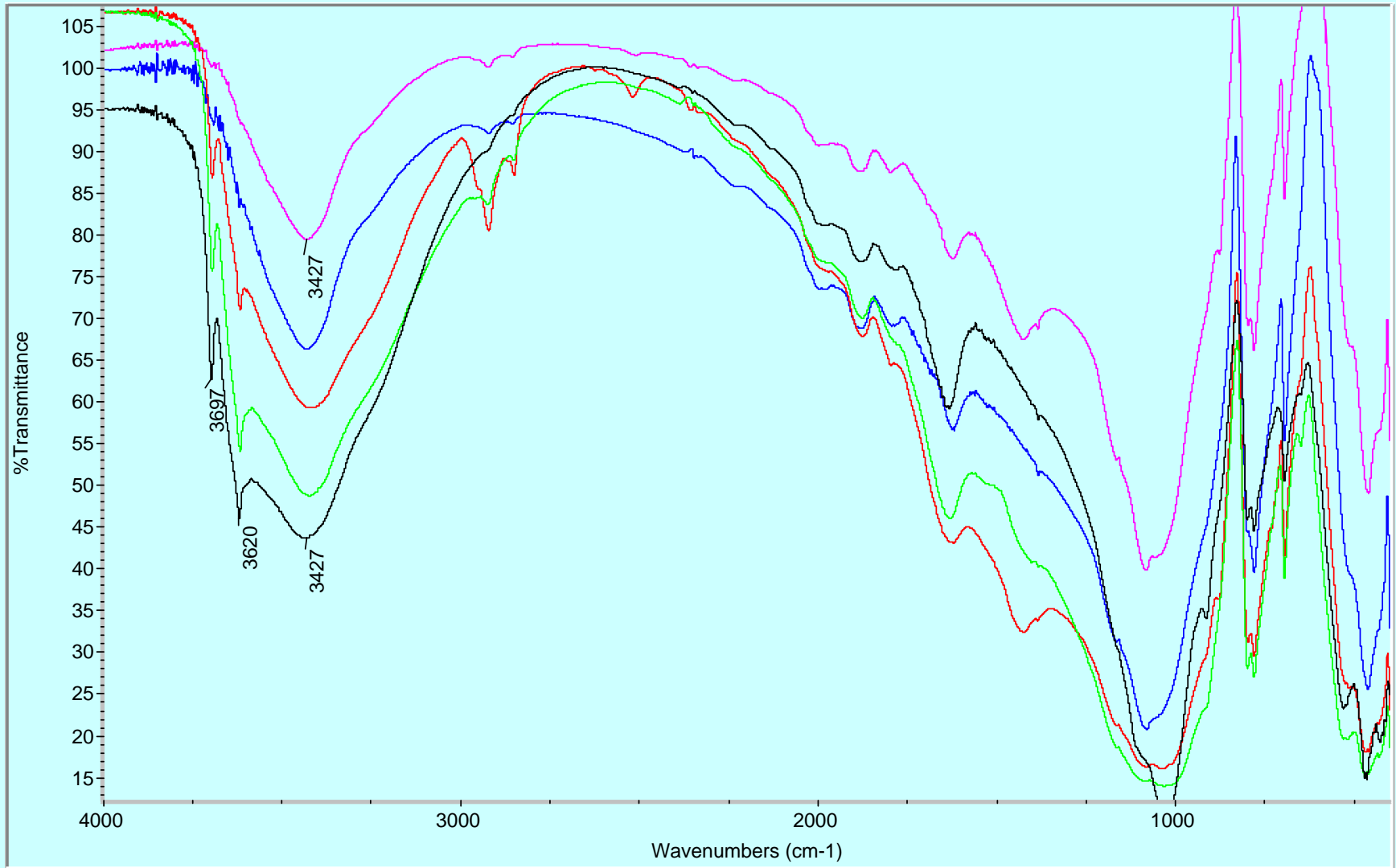
- **Interaction of 2-Chlorovinyl dichloroarsine and its destruction products with ethanedithiol**



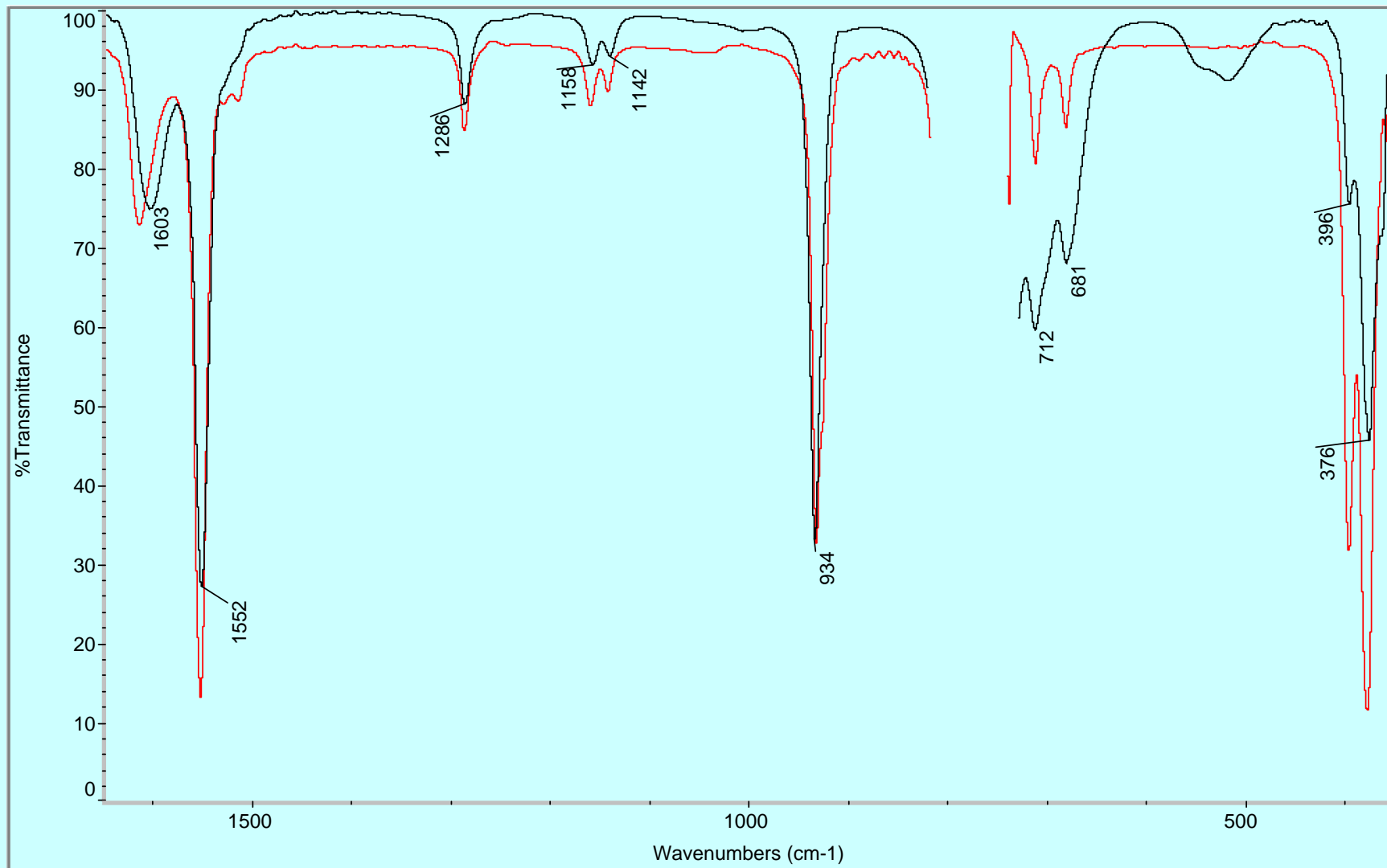
Location of main absorption bands on IR spectra of standard substances; ν , cm^{-1}

4

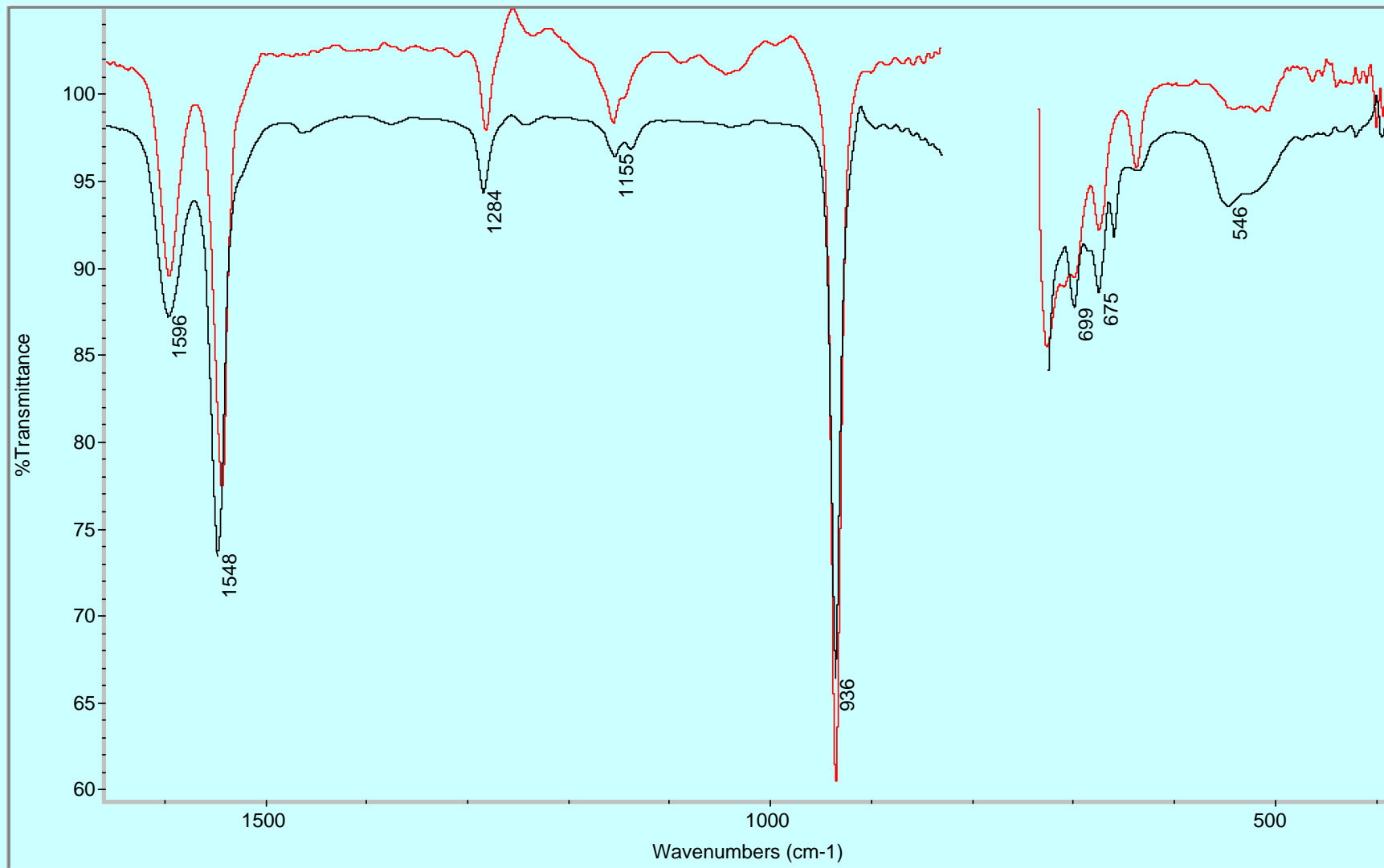
Lewisite (CCl_4 or n-hexan ($\sim 800 \text{ cm}^{-1}$))	2-chlorovinyl arsenic acid (CCl_4)	2-chlorovinylarsine oxide (KBr pellet)
6014		5930
5966		
4324		
4167		4162
3061		
3048	3045	3043
3030		3010
1850		1855
1683	1686	1694
1614	4596	1585
1553	1543	1537
1287	1282	1287
1160	1155	1153
1143	1144	
933	936	938
807*		800
		781
758*		
712	710	
	698	699
681	675	660
633	636	
		628
	541	



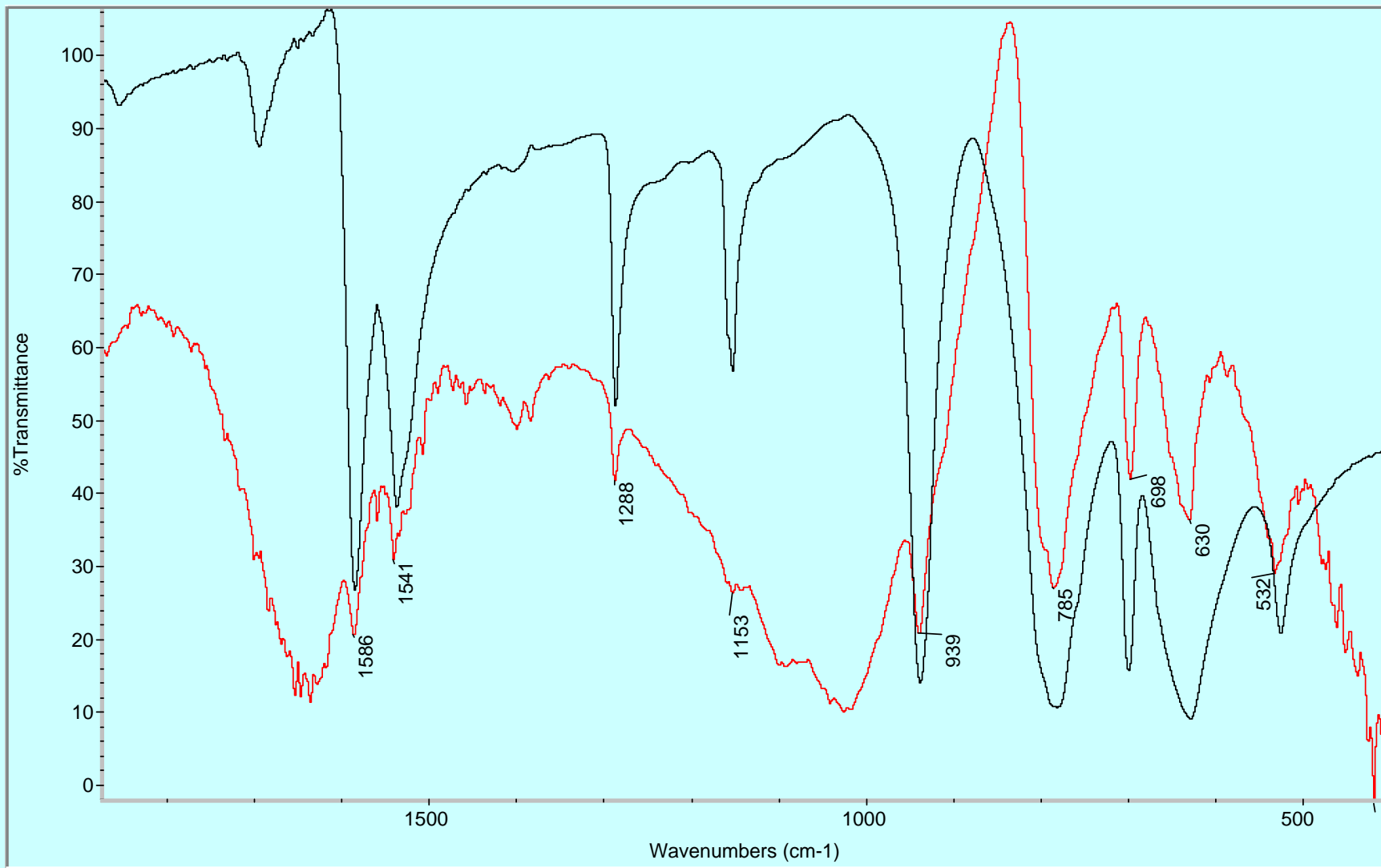
IR spectra of soil samples in KBr matrix in the field of 4000-350 cm^{-1}
(rose and blue lines – sand; red, green and black lines – clay)



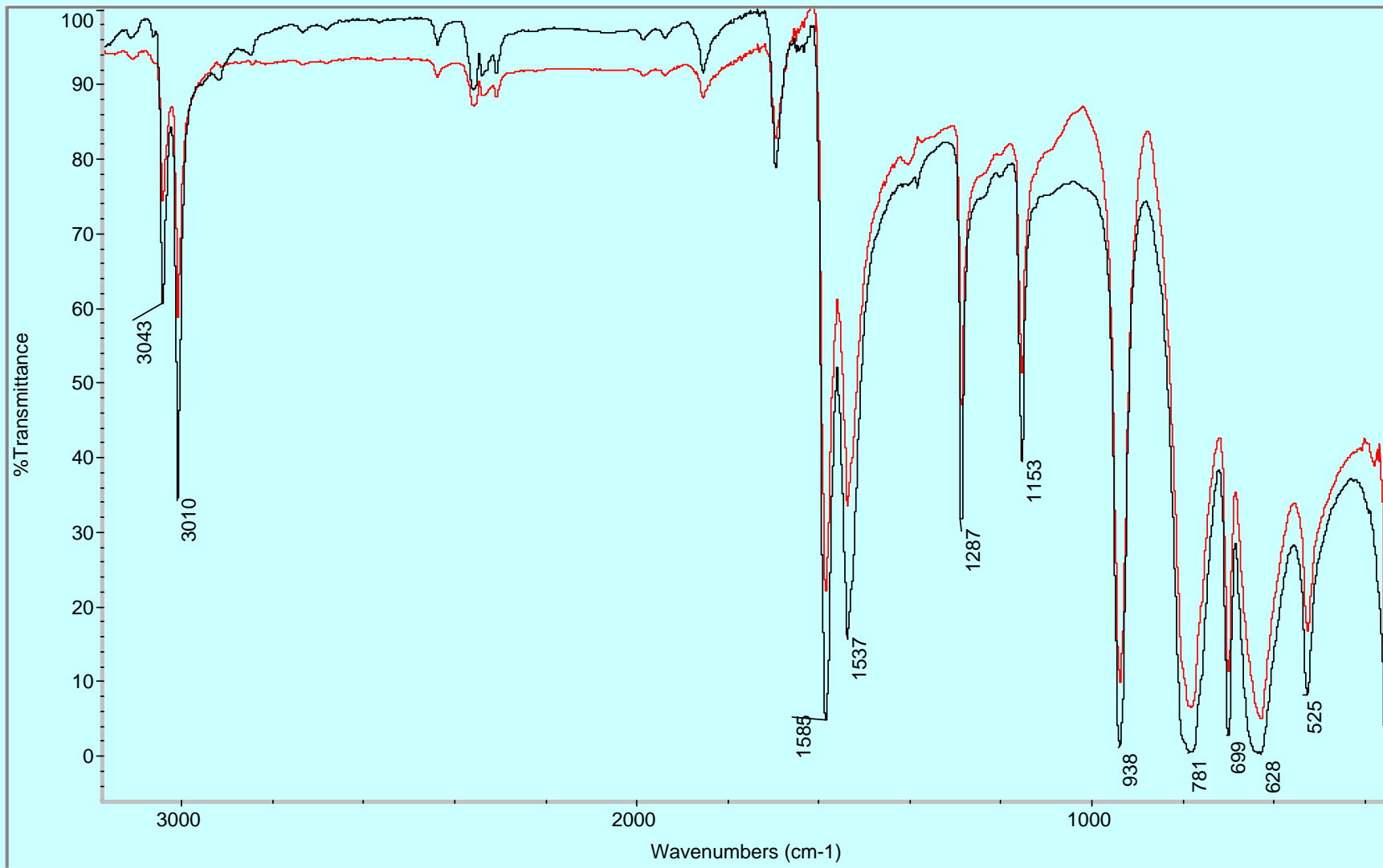
IR spectra of lewisite (red line) and extract from mixture of lewisite with sand (30mg/g) after 5 days exposition (black line) in the range of 1650-350 cm⁻¹. Solvent and extractant – CCl₄



IR spectra of extract from mixture of lewisite with clay (black line) after 2 hours exposition and 2-chlorovinylarsenic acid (red line) in the range of 1650-350 cm⁻¹. Solvent and extractant – CCl₄



IR spectra of lewisite mixture with clay (red line) after 4 days exposition and 2-chlorovinylarsine oxide (black line) in KBr matrix in the range of 1870-400 cm⁻¹.



IR spectra of 2-chlorovinylarsine oxide (red line) and dry residue after water evaporation (black line) in the range of 3200-350 cm-1.

CONCLUSION

- Using FTIR Spectroscopy the lewisite behavior in different soils and water media was investigated. On the base of this investigation the following conclusions can be made.
- Character and level of lewisite transformation in soils is a function of water content and state in them. No lewisite transformations were registered at least during 5 days after its introduction into the samples. Also, in the sand samples no toxic agent or its destruction products were determined.
- On the contrary, lewisite in the ground and clay soil samples is quickly destructed. Thus after 2.5 hours the toxic agent in these objects was not registered. In soil extracts the primary product of lewisite hydrolysis (2-chlorovinyl arsenic acid) was identified. The base of the soil sample after extraction is the secondary product of lewisite hydrolysis – 2-chlorovinyl arsenic oxide. The last one may be identified at the concentration about 300µg/g, and lewisite itself in sand at the concentration about 150µg/g.
- As a result, we can conclude that lewisite itself and its destruction products may be identified in soil samples by IR spectroscopy method. In water media lewisite may be identified only indirectly on the base of the secondary product of its hydrolysis 2-chlorovinyl arsenic oxide after water removing from the sample.