Alizarin

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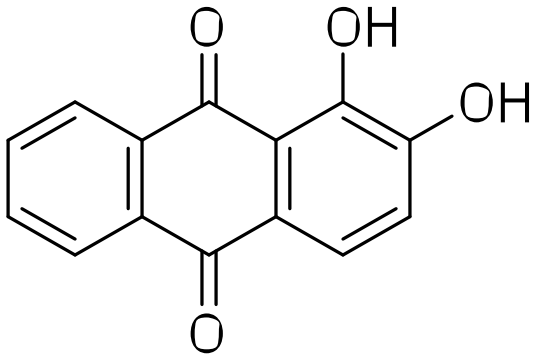
History

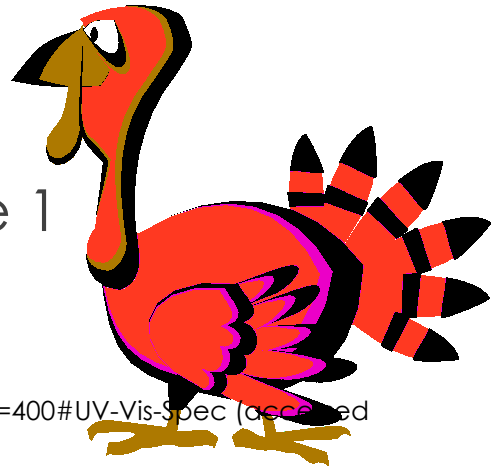
- Prominent dye derived from a madder plant
- Named after the "alizari" roots of the Rubia tinctorum plant
- Used on fabrics, including the uniforms for the British Army → nickname of "redcoats"

AppliChem, http://www.applichem.com/en/products/product-detail/as/alizarin-ci-58000/ (accessed February 25, 2011)
Wikipedia, http://en.wikipedia.org/wiki/Alizarin (accessed February 26, 2011)

Alizarin



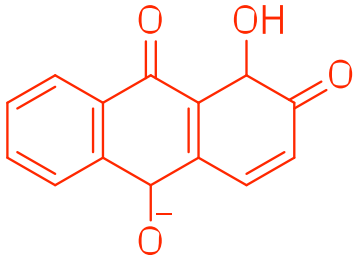
- $C_{14}H_8O_4$
- 1,2-dihydroxy-9,10-anthraquinone
- Synonyms: Turkey red, mordant red 11, alizarin B, alizarin red, madder lake, dye's madder, & deep crimson
- Derivative of anthraquinone
  - hydroxyl groups substituted at the 1 and 2 positions



NIST Chemistry WebBook, http://webbook.nist.gov/cgi/cbook.cgi?ID=C72480&Mask=400#UV-Vis-Spec (accessed February 25, 2011)

Uses

pH 0 to 6.4



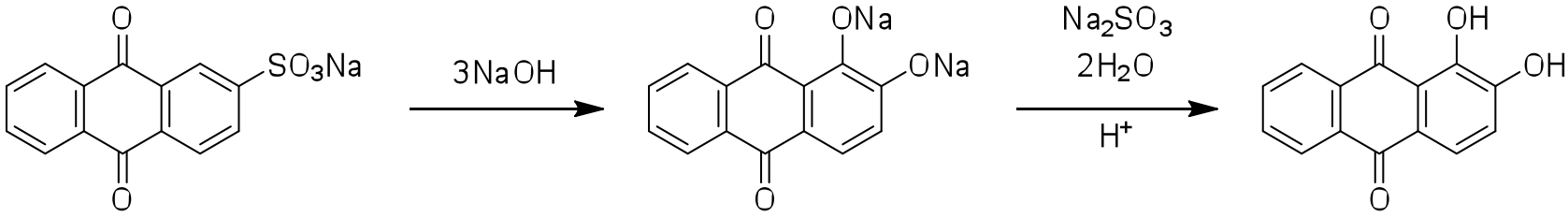
pH 6.4 to 12.0

- pH indicator
  - 0-6.4 → yellow
  - 6.4-12.0 → red
- Biochemical assay (stain)
  - can be used to identify calcium in tissue sections
  - calcium sites covered & surrounded by heavy orange-red precipitate

Shakhashiri, B. *Chemical Demonstrations: A Handbook for Teachers of Chemistry*; Univ. of Wisconsin Press, 1989, 21
Wikipedia, http://en.wikipedia.org/wiki/Alizarin (accessed February 26, 2011)

Synthesis

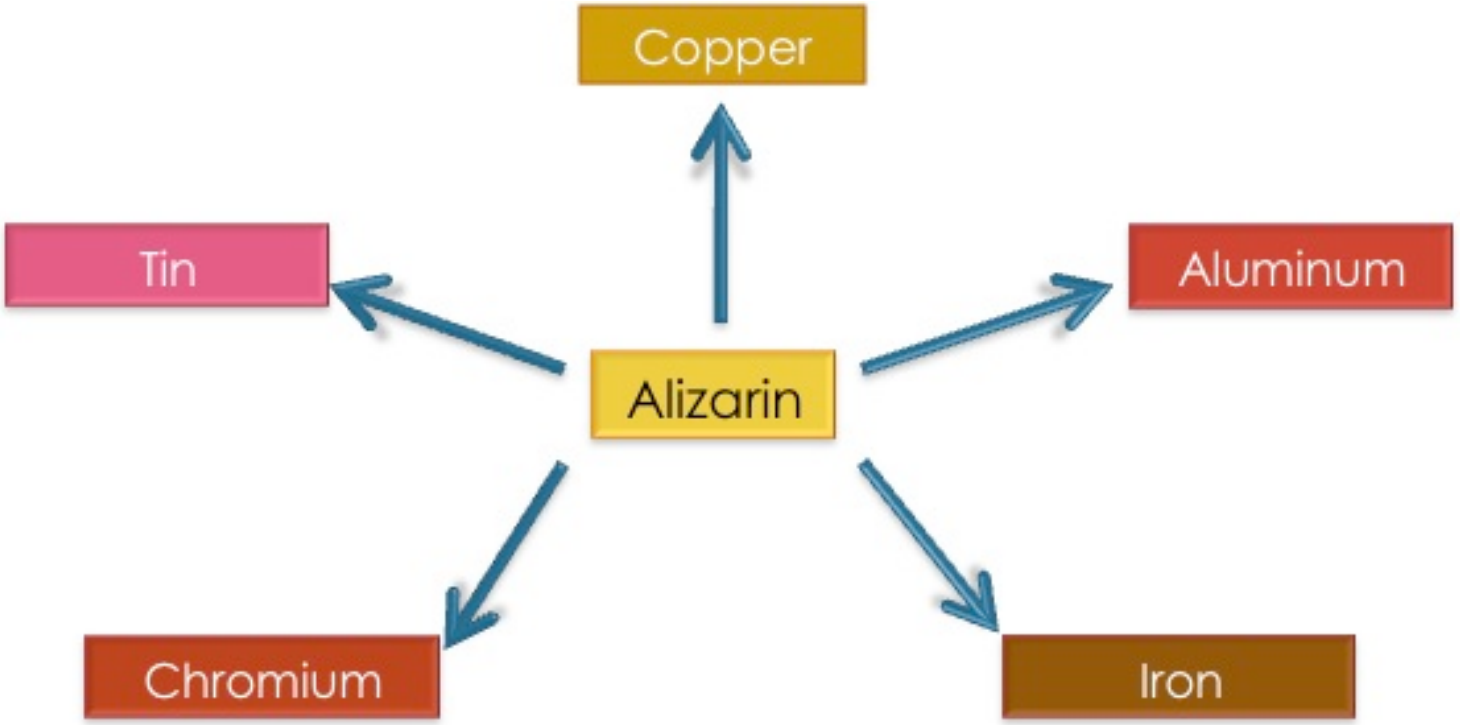
- Extracted from the pigment of root of madder
- First natural dye to be produced synthetically by Graebe & Liebermann (published January 14, 1869)
  - sharp decline in France's madder growing industry
- Process involves the replacement of the sulfonate group followed by an oxidation of oxygen from the atmosphere



Thomson, R. H. The Total Synthesis of Naturally Occurring Quinones, *Science*, **1992**, 10, 312-313
Williams, D. L.; Ronzio, A. R. A Contribution To The Total Synthesis Of Alizarin. Synthesis Of 1,2-Dihydroxy-9,10-Anthraquinone-9-C^{14}. *J. Org. Chem.* **1953**, 18, 489-495

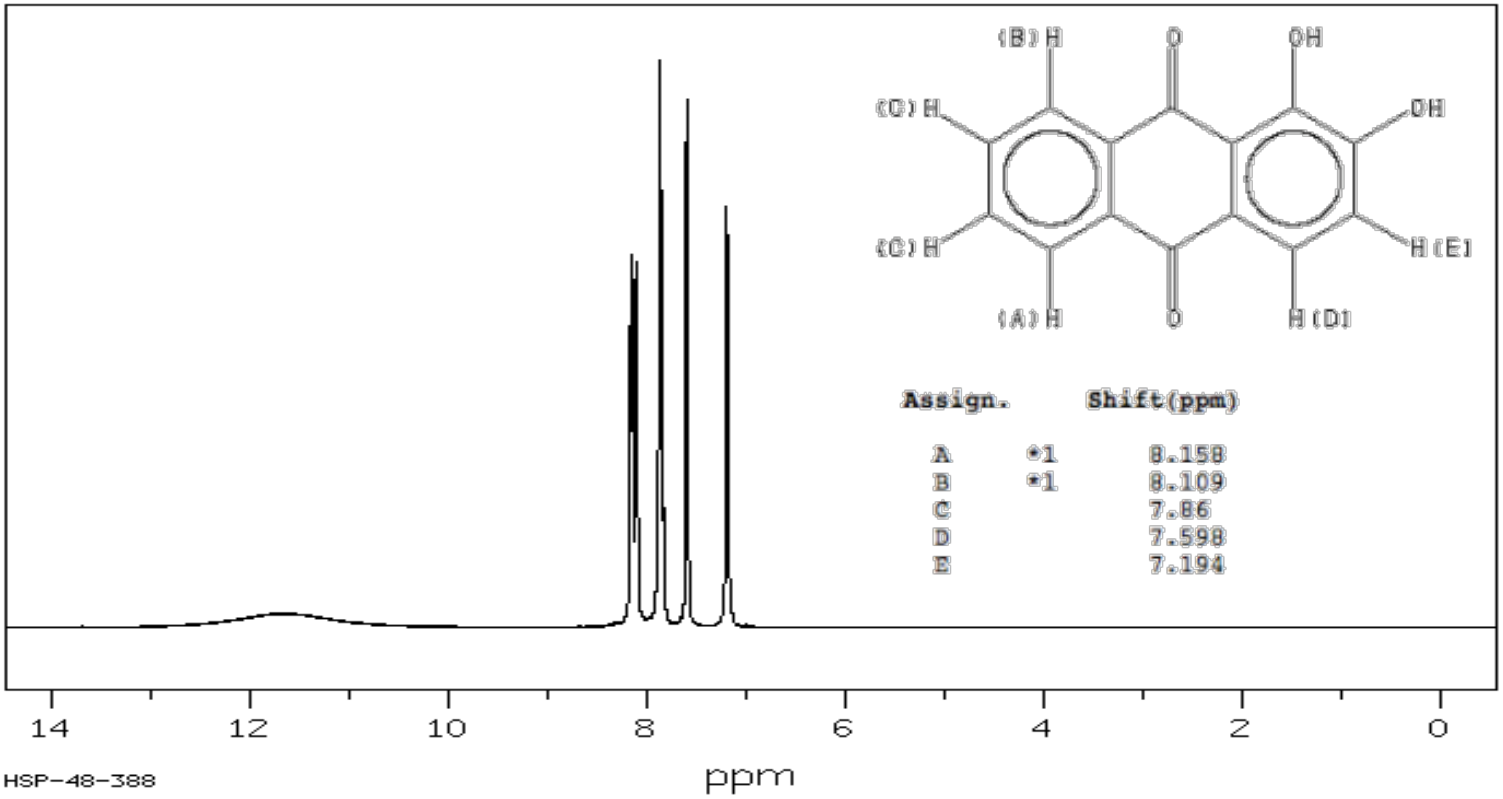
Derivatives of Alizarin

- Chelates with different metals to form other colors



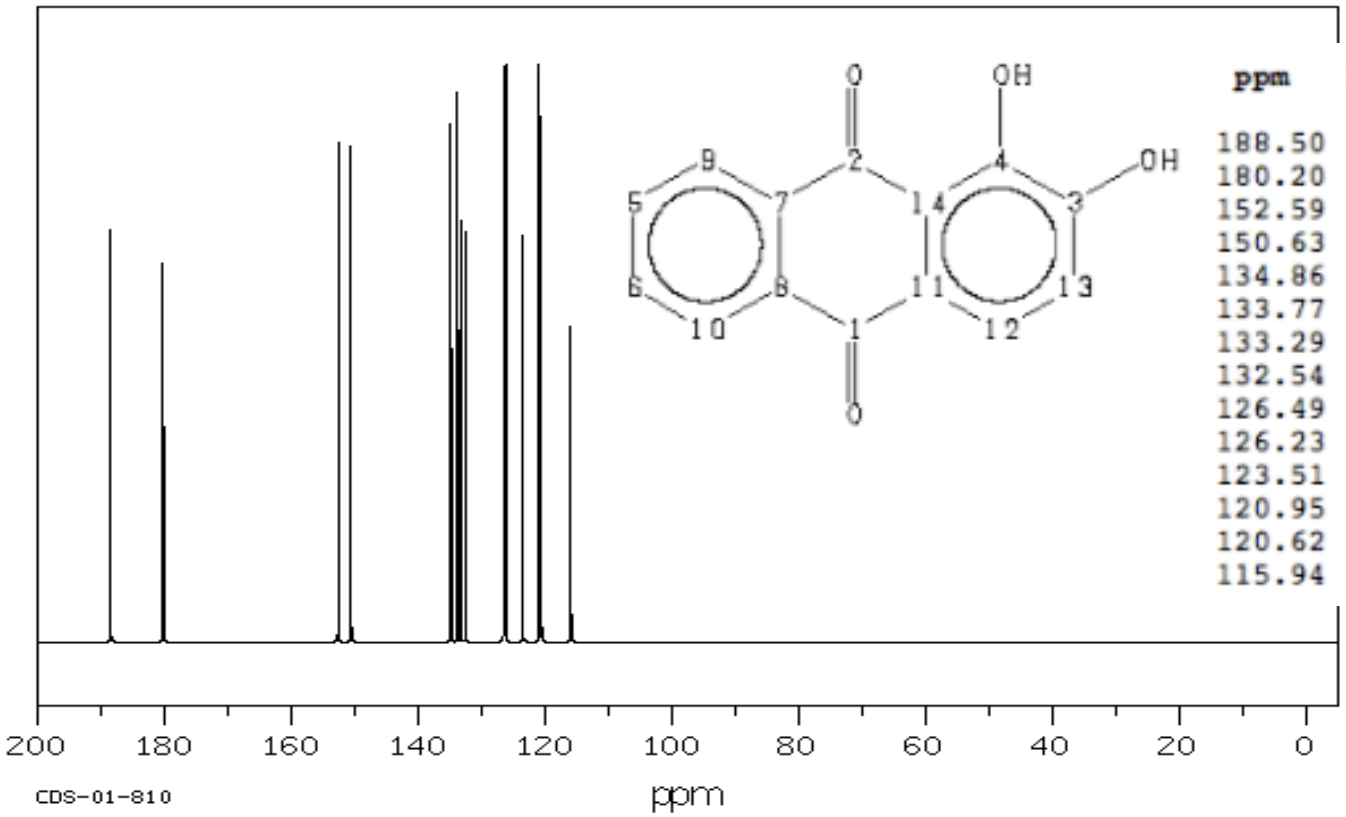
Butler, I. and Furbacher, J. Chemistry and Artists' Pigments. *J. Chem. Edu.*, **1985**, *62*, 334-336

Proton NMR



Spectral Database for Organic Compounds, http://riodb01.ibase.aist.go.jp/sdbs/cgi-bin/direct_frame_top.cgi (accessed February 28, 2011)

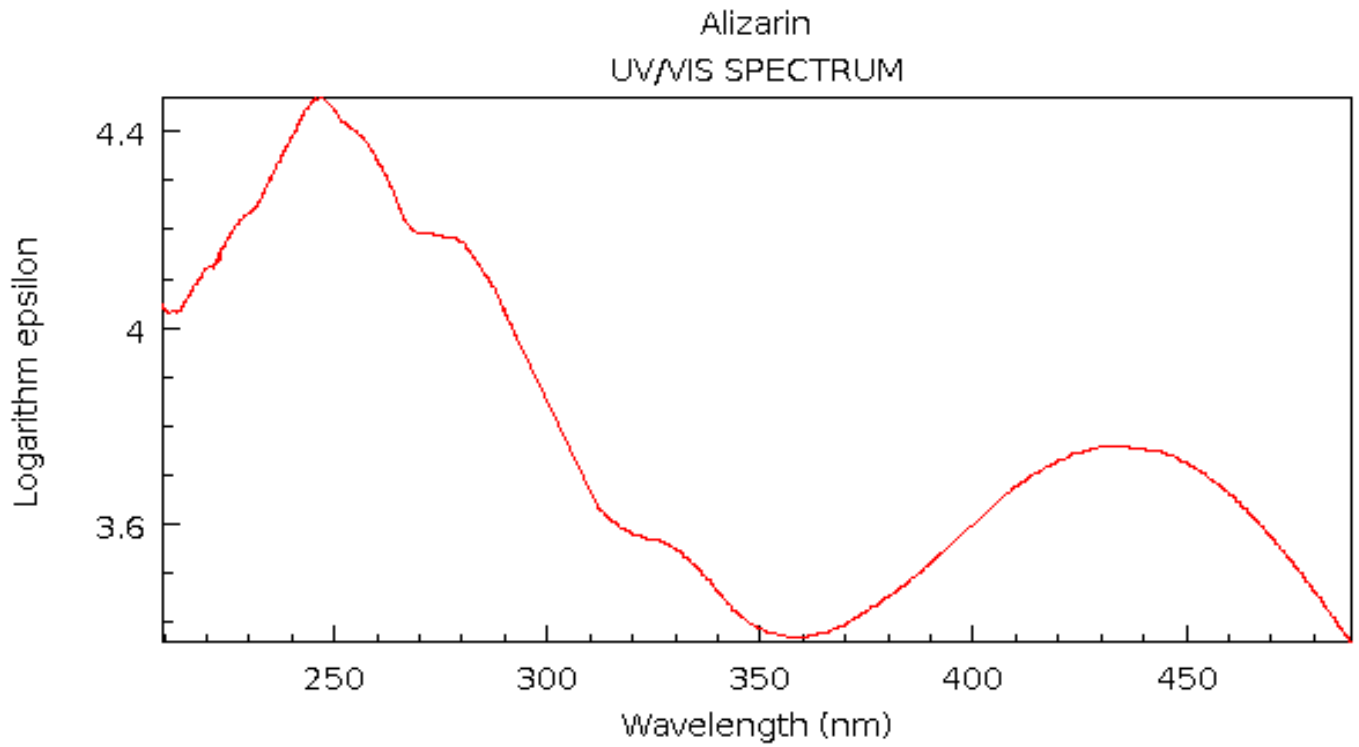
Carbon NMR



ppm	Int.	Assign.	
188.50	715	1	
180.20	657	2	
152.59	864	3	
150.63	857	4	
134.86	898	5	*
133.77	950	6	*
133.29	728	7	#
132.54	709	8	#
126.49	996	9	*1
126.23	1000	10	*1
123.51	705	11	
120.95	999	12	
120.62	909	13	
115.94	547	14	

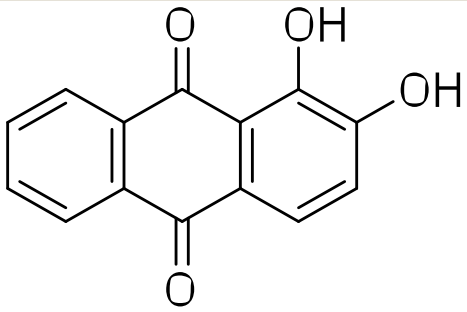
Spectral Database for Organic Compounds, http://riodb01.ibase.aist.go.jp/sdbs/cgi-bin/direct_frame_top.cgi (accessed February 28, 2011)

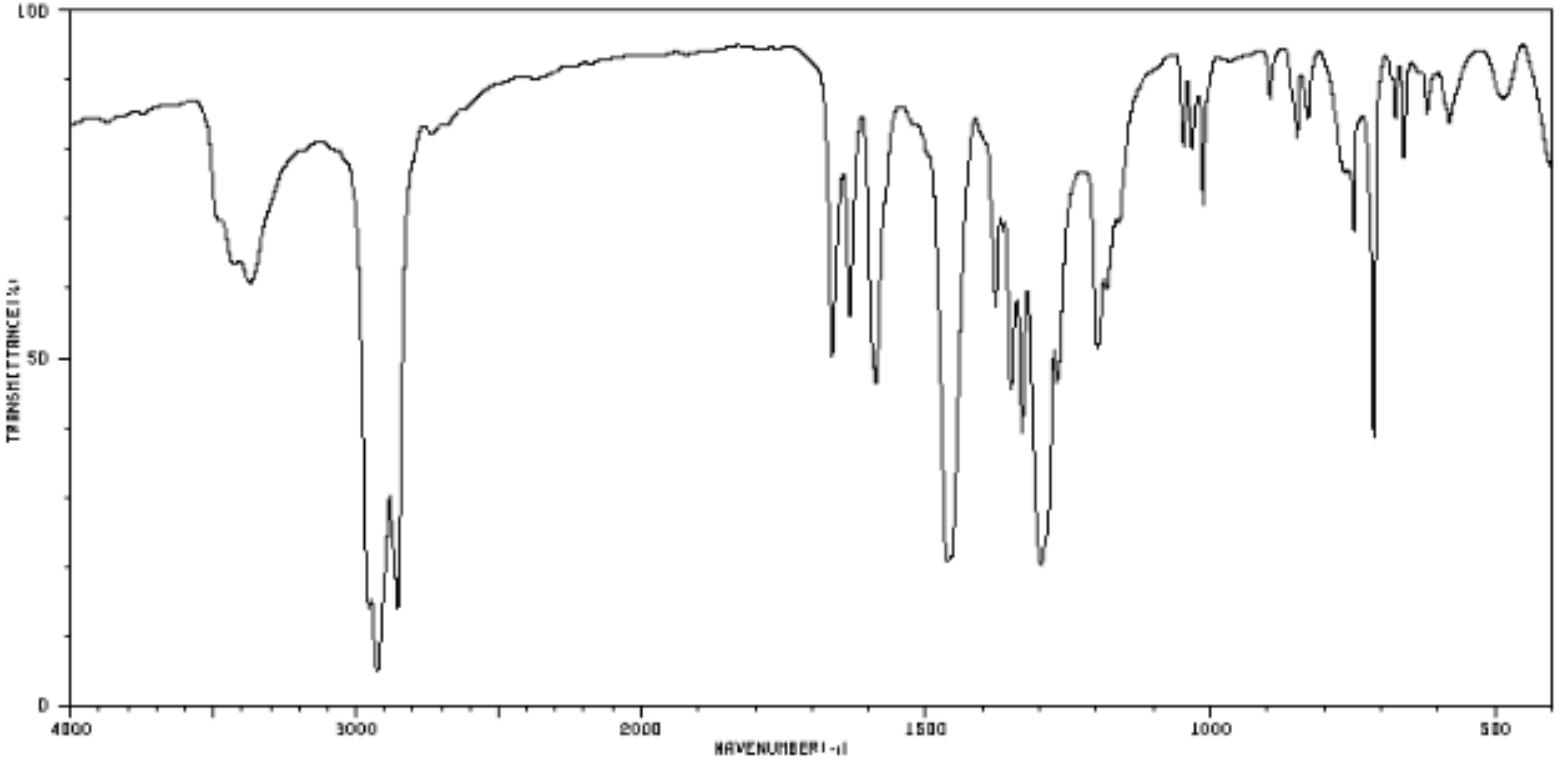
UV/Vis



NIST Chemistry WebBook (http://webbook.nist.gov/chemistry)

FT-IR





Spectral Database for Organic Compounds, http://riodb01.ibase.aist.go.jp/sdbs/cgi-bin/direct_frame_top.cgi (accessed February 28, 2011)