

Probing the Thermochromicity of Fabric Dyed with 6-Bromoindigo and 6,6'-Dibromoindigo, Components of Tyrian Purple*

Keith Ramig¹, Olga Lavinda¹, Timone Eskaros¹, Tazrian Islam¹, Sasan Karimi², and Christopher Cooksey³

¹Department of Natural Sciences, Baruch College of the City University of New York, Box A0920, 1 Bernard Baruch Way, New York, NY 10010, USA.

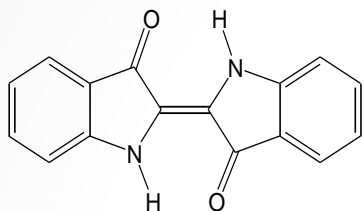
²Department of Chemistry, Queensborough Community College of the City University of New York, 222-05 56th Ave., Bayside, New York, NY 11364, USA.

³59 Swiss Avenue, Watford, Hertfordshire, England WD18 7LL, UK.

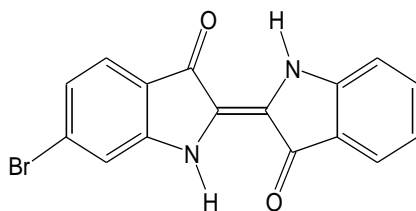
Abstract: Fabrics dyed with 6-bromoindigo turn noticeably blue when heated in water, while dyeings with 6,6'-Dibromoindigo turn strikingly red under the same treatment. New data will be presented which probe the nature of these color changes and their dependence on the solvent used.

*This presentation is dedicated to Professor Lou Massa on the occasion of his 80th birthday.

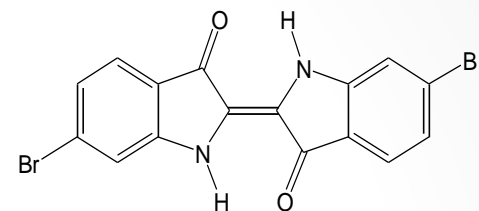
MBI-Dyed fabrics turn blue upon brief heating in water, while DBI-dyed fabrics turn red



Indigo



6-Bromoindigo
(MBI)



6,6'-Dibromoindigo
(DBI)



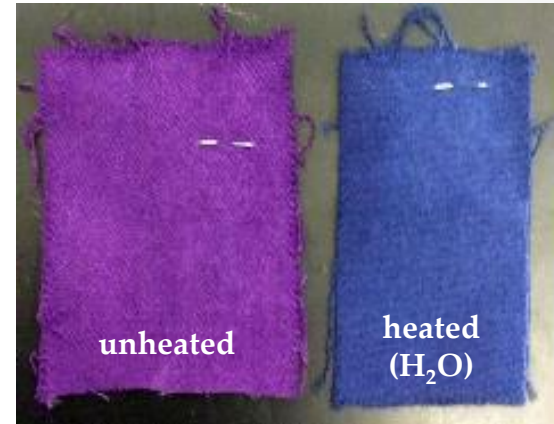
Silk dyed with 6-bromoindigo (right column) and 6,6'-dibromoindigo (left column)



Murex brandaris and *Murex trunculus*,
sources of Tyrian purple
containing 6-bromoindigo
and 6,6'-dibromoindigo

CIELAB Colorimetry Analysis of MBI-Dyed Wool Heated at 80°C for 20 Minutes

Solvent	ΔL	Δa	Δb	ΔE_{ab}
H ₂ O	0.5	-9.8	2.2	10
Ethanol	5.2	-20	1.5	20
Butanol	1.2	-2.3	0.6	2.7
Toluene	0.9	-0.8	0.5	1.3
(no solvent)	0.1	-0.3	0.3	0.4

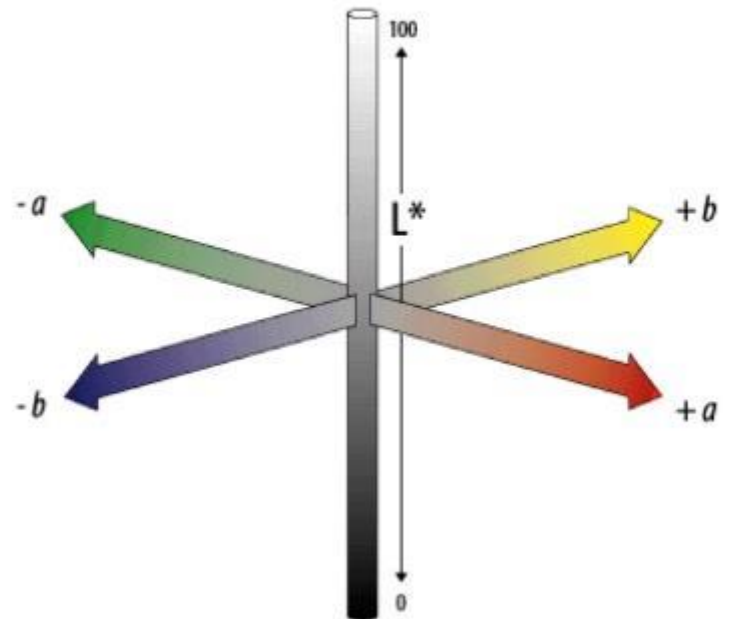


All L (lightness) values change towards lighter.

All a (red-green) values change to less red.

All b (yellow-blue) values change to more blue.

$$\Delta E_{ab}^* = \sqrt{(L_2^* - L_1^*)^2 + (a_2^* - a_1^*)^2 + (b_2^* - b_1^*)^2}$$



Olga Lavinda, Irina Mironova, Sasan Karimi, Federica Pozzi, Jacopo Samson, Hiroko Ajiki, Lou Massa, Keith Ramig *Dyes and Pigments*, **2013**, *96*, 581-589:
“Singular thermochromic effects in dyeings with indigo, 6-bromoindigo, and 6,6'-dibromoindigo”

Keith Ramig, Olga Lavinda, David J. Szalda, Irina Mironova, Sasan Karimi, Federica Pozzi, Nilam Shah, Jacopo Samson, Hiroko Ajiki, Lou Massa, Dimitrios Mantzouris, Ioannis Karapanagiotis, Christopher Cooksey *Dyes and Pigments*, **2015**, *117*, 37-48:

“The nature of thermochromic effects in dyeings with indigo, 6-bromoindigo, and 6,6'-dibromoindigo, components of Tyrian purple”

Keith Ramig, Aygul Islamova, John Scalise, Sasan Karimi, Olga Lavinda, Christopher Cooksey, Athina Vasileiadou, Ioannis Karapanagiotis *Structural Chemistry*, **2017**, *28*, 1553-1561:

“The effect of light and dye composition on the color of dyeings with indigo, 6-bromoindigo, and 6,6'-dibromoindigo, components of Tyrian purple”