

A Comparison and Analysis of Dyeability between Metal-Containing Dyestuff and Developing Dyestuff & Trends in the Evaluation System of Harmfulness and Dangerousness

Hea Jung Lee, Ji Yang Park, Young Hwan Park

Digital Dyeing and Finishing Technology Team, Korea Institute of Industrial Technology, Ansan,
Kyunggi-do 426-791, Korea

1. INTRODUCTION

Most of the waste matters generated as a result of human activities are toxic pollutants. Especially, those pollutants that are thrown into the sea are known to cause lethal damages to the marine environment and ecosystem. In Korea, the government allows legal dumping of waste matters into the sea as long as they meet the requirements prescribed in the Prevention of Marine Pollution Act. But there are many countries that take a different approach towards waste matters thrown into the ocean ; Canada, the Great Britain and other advanced nations in Europe have long forbidden any kinds of sewage sludge dumping into the ocean and applied very strict control regulations to certain kinds of waste matters that can be thrown into the ocean only in exceptional cases. The dyeing process produces a good amount of wastewater sludge, whose dumping involves complex difficulties due to the secondary waste matters according to the environmental-friendly trends in the world. It's urgent to turn both dyes and dyeing process environment-friendly, which poses the biggest task for the industry to take a future-oriented note.

This study compared and analyzed the existing dyes containing heavy metals and an improved one in terms of dyeability and investigated the trends in the evaluation system of their harmfulness and dangerous.

2. EXPERIMENTAL

2.1 Sample and Chemical agents

Used to assess the dyeability of the dyes was wool. 60's, 100g/yds. For comparison and analysis purpose, the dyes containing metal(MM) and the one that replaced the harmful metals with non-toxic ones(DM) were used. Acetic acid was used as the first grade reagent.

2.2 Evaluation of Exhaustion

The dyes and samples were put in the Dye-o-meter(Dye Max-L, Korea) and measured at 40°C every five minutes for 120 minutes.

2.3 Evaluation of containing-Metal and Harmful Amines

Using the ICP(ULTIMA II, Jovin Yvon/France) and following the ETAD standards, the dyes were put to acid digestion in nitric acid and measured for their heavy metal contents. Harmful amines were measured with the 35 LMBG 82, 02-1, 2, 3, 4 method using the GC/MS(Agilent, U. S. A.).

3. RESULTS AND DISCUSSION

All of MM1, MM2, and DM showed 95% or higher absorption rates. Recording the dyeability rates of 99%, both DM and MM2 turned out to be excellent dyes. With less contents of metals, the DM demonstrated the potential as environment-friendly dyes.

The allowance standard of heavy metals are 370, 1800 and 400 for Cr, Zn and Cu, respectively. While all three dyes recorded under the allowance standard level for Zn and Cu, both MM1 and MM2 far exceeded the allowance level for Cr. But DM that recorded 25.4 for the allowance level of 370 showed its potential as an alternative dye. The test results of harmful amines indicated that all three dyes got an ND finding and were thus considered to be safe.

Table 1. Metal content(ppm)

Element	MM1	MM2	DM
Zn	ND	ND	25.4
Cu	ND	31.9	74.6
Cr	21704.5	17236.1	38.5

4. REFERENCES

1. Sang-il Lee, Sook-kyung Yeo and Yun-cheol Lee. *海事法研究*, 19, 175-201(2007).
2. Jung-ho Kim, *産業保健*, 214, 56-64(2006).