



ASSESSMENT OF THE OPTICAL DENSITY OF THE BACKGROUND WHEN PRINTING TEXT ON A COLOR BACKGROUND

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Abstract

This work is aimed primarily at research on the compliance of publications for children of primary preschool age. All research samples were selected from various retail chains and were published by different publishers, thus, even based on the results of studies of one sample book publication from the selected publishing houses, it will be possible to talk about compliance with standards for products subject to mandatory certification.

Keywords: Book, standard, paper, paint, samples, optical density, children, certification

Introduction

The optical density of the background when printing text on a colored background and/or multicolor illustrations should be no more than 0.3, and when printing reversed font, no less than 0.4.



The research results are presented in table 1:

Table 1. Optical density indicators.

«Давай сравним»	«Гадкий утенок»	«Зайчик»	«ОДОМАТОУ»
1	2	3	4
0,1	0,147	0,491	0,491
0,1	0,175	0,505	0,304
0,1	0,163	0,505	0,480
0,31	0,216	0,509	0,509
0,286	0,211	0,511	0,511
0,154	0,166	0,498	0,498
0,084	0,187	0,287	0,287
0,097	0,201	0,251	0,251
0,113	0,175	0,214	0,214
0,129	0,182	0,646	0,646
0,021	0,158	0,633	0,633
0,172	0,134	0,609	0,609
0,08	0,204	0,634	0,634
0,156	0,14	0,6	0,6
0,039	0,175	0,591	0,591
0,046	0,135	0,658	0,658
0,041	0,213	0,593	0,593
0,043	0,139	0,605	0,605
0,048	0,183	0,646	0,646
0,101	0,212	0,588	0,588
Max: 0,31 Min: 0,021	Max: 0,216 Min: 0,14	Max: 0,658 Min: 0,214	Max: 0,658 Min: 0,214

The background optical density is measured with a reflectance densitometer (an X Rite Spectrodensitometer was used during the test) behind a visibility filter at five image locations on the monitored page.

The result is considered negative on the page if the values of 3 out of 5 measurements do not meet the standards.

The result of control of one copy is considered negative if non-compliance with standards is detected on 4 out of 10 controlled pages of the copy.

If non-compliance with the standards is detected in at least one of the 3 controlled copies, then the result is considered negative.

1) Meets the requirements of the standard:

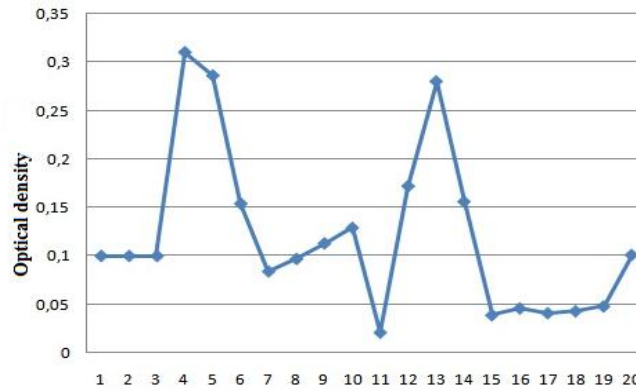


Figure 1. Background optical density measurement range

2) Meets the requirements of the standart:

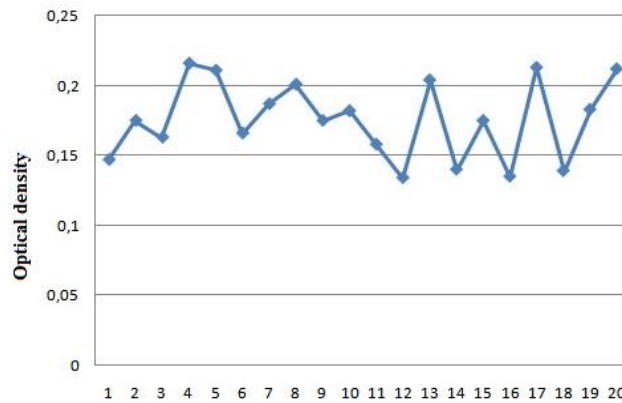


Figure 2. Background optical density measurement range

3) does not meet the requirements of the standart:

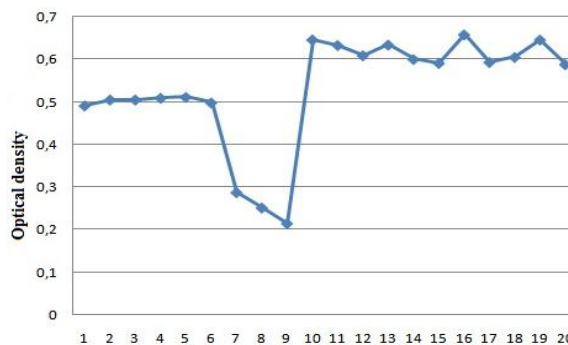


Figure 3. Background optical density measurement range

4) Meets the requirements of the standart



Figure 4. Background optical density measurement range

At this stage of research, only two publications meet the requirements of the “On the safety of products intended for children and adolescents” that came into force on April 29, 2011 and the currently valid Industry Standard “Book and magazine publications for children and adolescents” (OST 29.127 - 2002).

The use of narrow font style in publishing products is not allowed.

Type face - a set of lowercase and uppercase characters, numbers, punctuation marks, special characters and symbols. The font styles of any typeface differ in color saturation, proportions, contrast and slant of characters. The most common styles are Normal, Bold, Italic, Bold Italic, Condensed, and Extended. An italic font is formed by simply distorting (tilting) the characters in the original (Normal) font. Letters in italic style are only similar to straight letters in style, but their design is completely different.

Table 2. Font style

«Давай сравним»	«Гадкий утенок»	«Зайчик»	«ODOMATOY»
обычный	обычный	обычный	bold

The font style is determined according to GOST 3489.1 on 10 characteristic pages. The result for each parameter is considered negative if non-compliance

with the established standard is detected on 4 out of 10 monitored pages.

Book products should not release harmful substances into the model medium (distilled water) in quantities exceeding:

phenol - 0.05 mg/dm³;

formaldehyde - 0.1 mg/dm³;

lead - 90 mg/kg;

zinc - 1.0 mg/dm³;

arsenic - 25 mg/kg;

chromium (III) and (VI) - 60 mg/kg;

To conduct the study, samples of the observed publications were placed in distilled water for 24 hours. Then, the presence of harmful substances was assessed using IR spectroscopy. The results of these studies are presented in Figures 3.5 – 3.7.

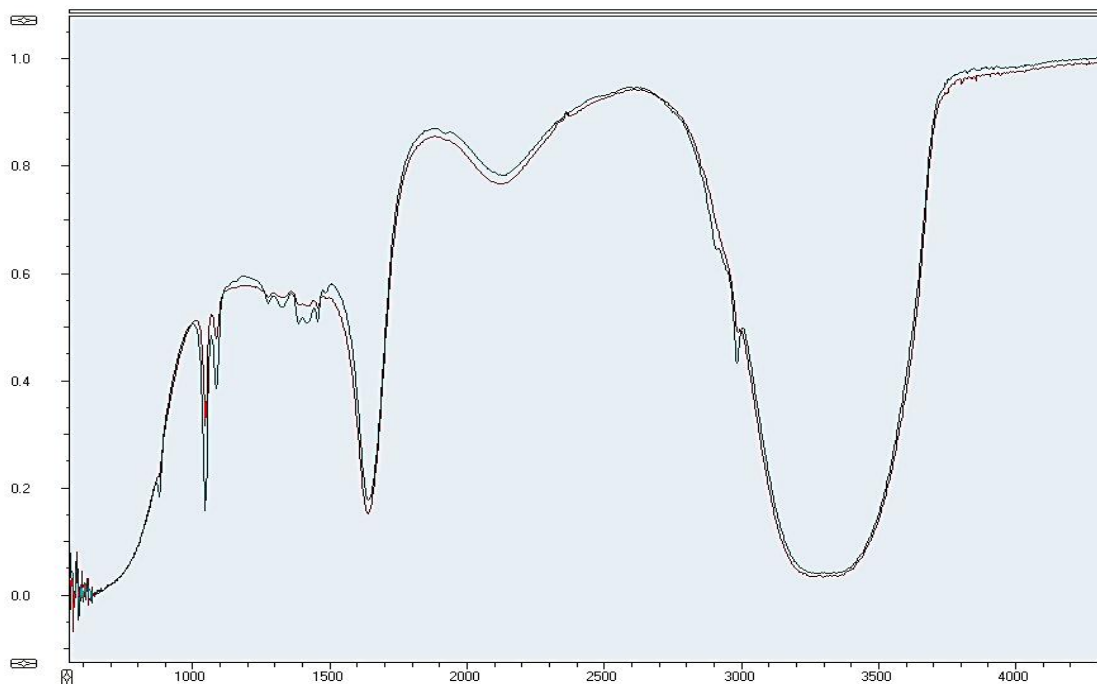


Figure 5. IR spectrum of a publication flushed «Давай сравним»

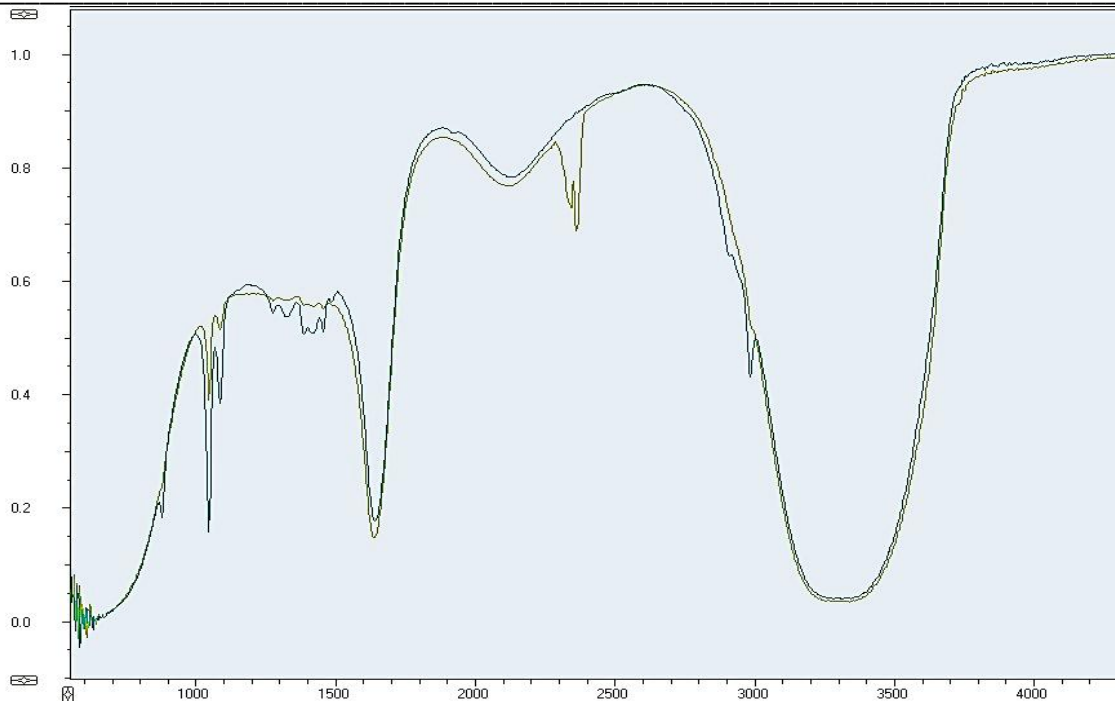


Figure 6. IR spectrum of a publication flushed «Гадкий утенок»

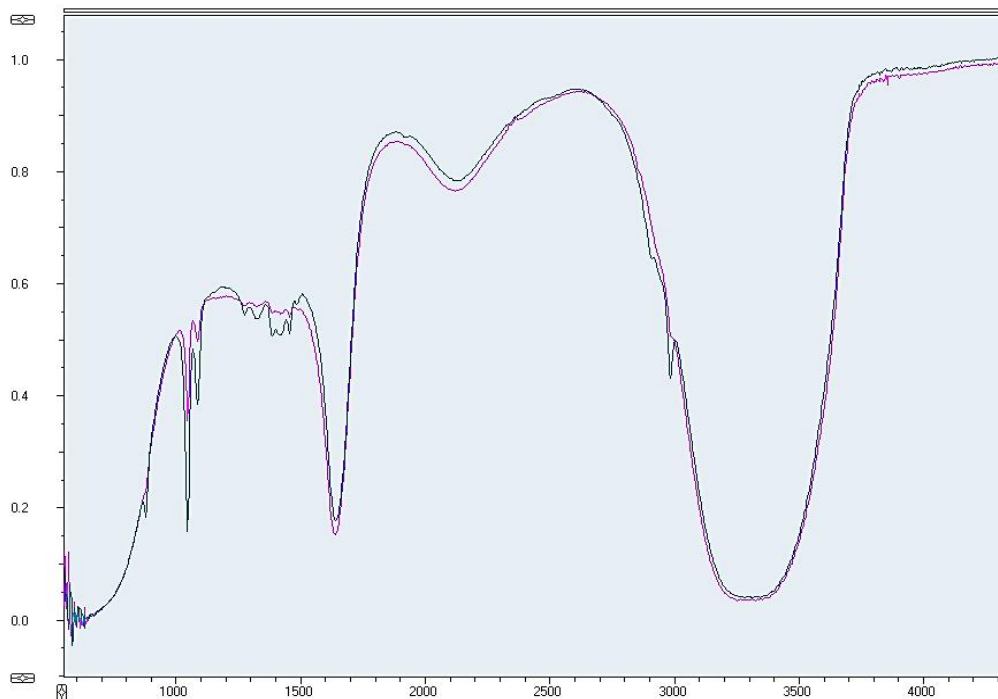


Figure 7. IR spectrum of a publication flushed «Зайчик»

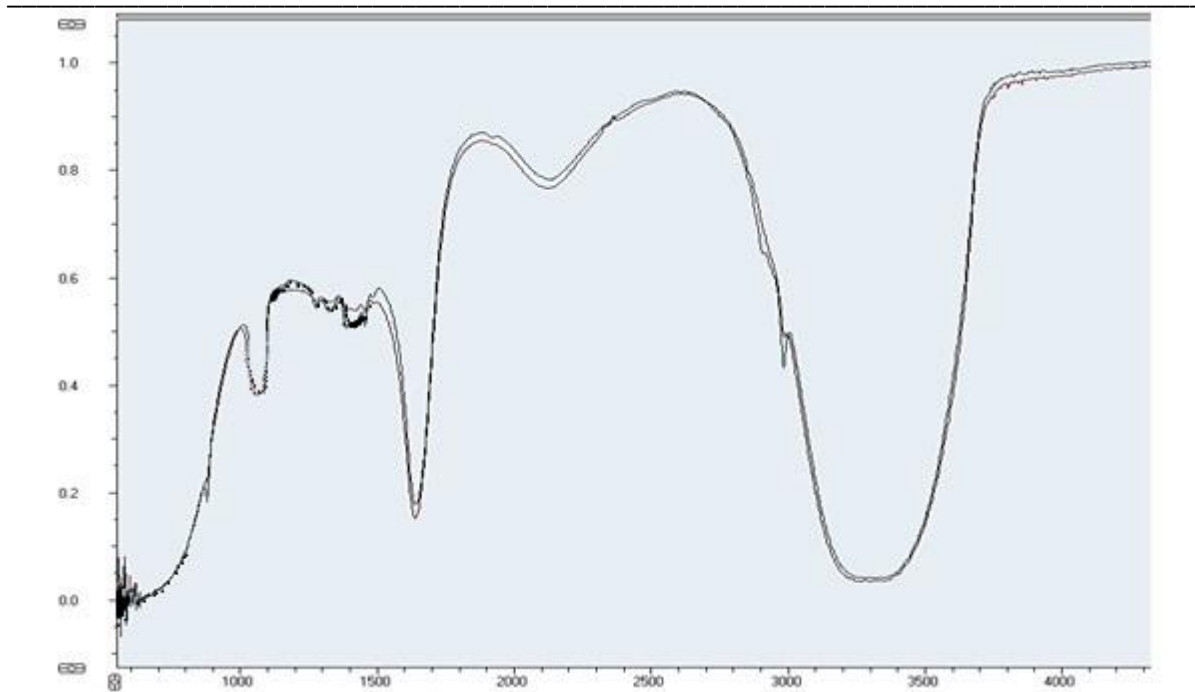


Figure 8. IR spectrum of a publication flushed «ODAMTOY»

Analysis of the results presented in Figures 3.5, 3.7 and 3.8 showed that there are no harmful impurities in the water washes made from the publications under study. Therefore, the publications under study comply with chemical safety requirements (Table 3.3). From the spectra in Figure 3.6 one can see the presence of vibrations in the frequency region of 2400 cm^{-1} , which indicates the presence of impurities not related to the spectrum of pure water.

Table 3. Results of testing for compliance with chemical safety requirements

Chemical safety requirements			
«Давай сравним»	«Гадкий утенок»	«Зайчик»	«ODAMTOY»
Compliant	does not match	Compliant	Compliant

In this study, the optical density of the background when printing text on a color background was assessed. The results indicate that background color significantly



influences the readability and contrast of printed text. The analysis of various printed samples showed that darker backgrounds tend to increase optical density, which may reduce text clarity, while lighter backgrounds provide better readability.

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