



FEATURES OF COLOUR REPRODUCTION ON TINTED MATERIALS BY UV INKJET PRINTING

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The demand for souvenir products is growing every year, facilitated by the emergence of new materials with non-standard surfaces that have different natures, textures, and colour. There is a need to ensure the identity of the corporate colour reproduction on such surfaces, which is appropriate and relevant [1], because the first thing the client pays attention to is colour, namely the accuracy of its reproduction in accordance with the original. As an alternative to traditional printing methods, UV inkjet printing is used in the production of souvenirs. The UV inkjet printing technology allows for the production of a full-colour and durable polymer coating characterized by resistance to radiation, moisture, temperature changes and most chemicals [2]. This study was conducted to determine the accuracy of corporate colour reproduction on tinted polymeric materials in the manufacture of souvenirs using UV inkjet printing. In [1], it was found that the colour of the printed material has a critical impact on the chromaticity of the colour, and a single-layer application of a white substrate can reduce the colour deviation during pad printing on bulk tinted materials but is still insufficient for accurate colour reproduction.


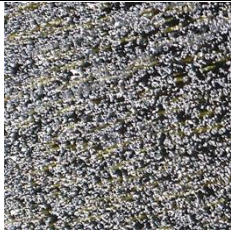
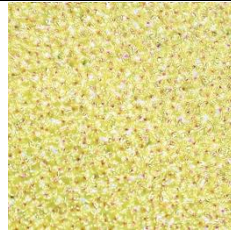
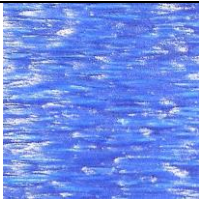
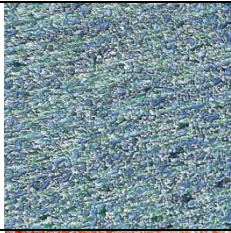
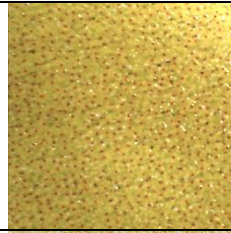





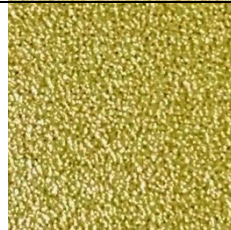
For the study, samples of tinted PVC plastic with a thickness of 3 mm were selected (table 1). To evaluate the colour reproduction on the selected materials by UV inkjet printing, we used two printing schemes:

- applying a single layer of UV ink to the tested material samples;
- applying a pre-white substrate to the tested samples; drying the prints; applying a layer of ink to the samples of materials with a pre-applied substrate.

Utilizing measuring tools and statistical data processing, a visual approach was employed to ascertain the prints' quality indicators. The visual observation took into account the saturation of the ink layer on each surface, transparency, and coating of the ink layer. Seeing the printed material allowed for an assessment of the ink layer's transparency. The solidity and uniformity of the ink layer application served as indicators of coating ability. Table 1 shows a comparison of photographic images taken with a digital microscope. The studied samples of materials 1–4 (Table 1) are characterized by surface microroughness, so the distribution of the ink layer on prints without a white substrate is uneven and of low intensity. The colour difference indicators for the samples are high; for example, sample 1 reaches 74 units [3].

When analysing the imprints, it was found that light UV inks, such as Yellow, applied in a single layer, are not 100% covering, and the colour of the printed material critically changes the hue of the original image. Therefore, we can say that printing without a layer of white substrate is not recommended for materials similar to the tested samples. In addition, when comparing the prints with the applied white substrate with the standard (white matte polystyrene), there is a tendency for the imprints to acquire the characteristic hue of the printed material. Thus, it can be assumed that a single layer of white substrate is not enough to accurately reproduce the colour without any colour difference.

Table 1 – Characteristics of the ink layer on the prints

№	Samples of PVC plastic, foamed, matte, 3 mm	Imprint without a white substrate	Imprint image on a white substrate	Characteristics of the ink layers
1	 Black			There is a high saturation of the ink coating; the material and the white substrate are also visible through the layer of the tested colour; there is pollution with pigments of another colour
2	 Blue			
3	 Red			There is an average saturation of the ink coating; the material and the white substrate are also visible through the layer of the tested colour; there is pollution with pigments of another colour
4	 Green			

The accuracy of colour reproduction when applying several layers of white ink requires further study. The study [3] determined that the thickness of the ink applied by UV inkjet printing in one layer is 0.1 mm, in two layers – 0.2 mm, it can be assumed that the double thickness of the ink layer will reduce the influence of the colour of the printed surface on the reproduction of the corporate colour. However, in this case, there may be a problem of misalignment of ink layers, which will be especially critical for thin stroke elements. In the course of research [2], it was found that the value of the misalignment of two layers applied one on top of the other is 0.12 mm. To prevent such problems when printing, it is necessary to correctly set trapping contours and control the minimum dimensions of graphic elements when preparing original layouts.

References

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