

Nitus Tipsotnaiyana 2014: Synthesized Nano-silica from Rice Husk to Improve Printing Quality of Flexography on White Kraft Paper. Doctor of Philosophy (Packaging Technology), Major Field: Packaging Technology, Department of Packaging and Materials Technology. Thesis Advisor: Assistant Professor Lerpong Jarupan, Ph.D. 137 pages.

Nano-silica from rice husk (nano-RHS) was synthesized and used in a water-based coating agent to improve the print quality flexography on white kraft paper. The rice husk was refluxed with an acidic 2 M HCl solution and calcined in a muffle furnace at 650 °C for 4 h. The particle size of the resultant rice husk ash was reduced to a very fine nano-level by hexadecyl trimethyl ammonium bromide (CTAB). The synthesized nano-RHS in different proportions 1%, 2%, 3%, 4% and 5% (w/w_{resin}) was added to the coating agent consisting of styrene resin. The coating agent with nano-RHS additive was applied by gravure rolling onto the surface of a 170 g/m² white kraft liner of corrugated board 3–4 µm in thickness. The flexographic print quality was determined with printing details of 31.5 lpc using water-based process colors (CMYK). It was found that the proportions of nano-RHS significantly affected on properties of the coating agent and the print quality ($p < 0.0001$). The results indicated that the coating agent with 1% nano-RHS was the most promising for enhancing the flexographic print quality on the white kraft paper. The viscosity of coating agent with 1% nano-RHS was 39.2±1.322 cp and was suitable for coating on the white kraft liner. Water absorption was 64.04±5.65 g/m² and roughness of the coated kraft paper with 1% nano-RHS was 5.48±0.36 sec-beck. At this fraction, the best print quality in terms of high sharpness of fonts and texts, line art, realistic image, and TVI curve (under the requirements of ISO 12647-6) were achieved. In addition, low tone-value and ΔE_{ab}^* with a large, three-dimensional color profile and the widest color gamut were also obtained.

Student's signature

Thesis Advisor's signature