

# Structural Studies of Mechanical Printing Paper Coating Using SEM

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## ABSTRACT

In this study, surface coating of mechanical printing paper was carried out by precipitated calcium carbonate (PCC) and Nanoclay. Specimens viewed using a conventional scanning electron microscope (SEM) need to be coated with electrically conductive material before generation high-resolution images. The structural images of SEM from fiber net status and mineral coating showed that PCC led to greater uniformity of the paper surface than using Nanoparticles. The result revealed that it is possible application up to 50 percent of the minerals for coating of printing paper.

**KEYWORDS:** Coating, precipitated calcium carbonate, Nanoclay, Structural properties, scanning electron microscopy.

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## 1. INTRODUCTION

Comparing the market prices of filler and pulp fibers, the advantage of replacing fibers with pigment is evident, and hence, fillers are an important component in practically all printing and writing papers. Pigment properties are important in determining the effects of filler on the properties of paper and paperboard (Bown 1997; Fairchild 1992).

In printing and writing papers, precipitated calcium carbonate (PCC) is being increasingly used to reduce raw material costs and basis weight of paper while maintaining thickness, or to customize the products by improving some critical paper properties.

Several methods have been proposed to increase the filler content in paper (Middleton et al.1985; Allan et al. 1998; Klungness et al. 1993).

Fibers and fillers are two important categories of raw materials used in the formation of paper products. Fiber engineering for papermaking is a discipline that has attracted worldwide attention, and the relevant approaches (such as mechanical, chemical, enzymatic, and genetic modifications) are expected to impact process energy performance, improved and new forest products, sustainable forestry, and breakthrough technologies.

### Experimental

Paper Samples were supplied by Mazandaran Wood and Paper Factory.

An acrylic styrene emulsion Simacryl SH-305 was used for blade coatings. The viscosity, solid content and pH of the emulsion, according to manufacturer, are given in Table 1.

Table1. The characteristic of the resin

Resin	Viscosity (cP)	Solid content (%)	pH
SH-305	300-900	50±1	4-5

Nanoclay modified with a methyl, tallow, bis-2- hydroxyethyl, quaternary ammonium (CEC = 90 meq/100 g clay,  $d_{001} = 18.5 \text{ \AA}$ ) was obtained from Southern Clay Products Co. USA, with trade name of cloisite 30B.

Precipitated Calcium Carbonate (PCC) was supplied by Ahovan Factory from Iran.

The components of each sample (Resin, PCC and, Nanoclay) were pre-mixed to prepare homogeneous compounds according to formulations given in Table 2.

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**Table 2:** Composition of the studied formulations

Formulation code	Resin (%)	Nanoclay (%)	PCC (%)
A	90	10	0
B	50	0	50

### Scanning Electron Microscopy

Paper samples were sputter-coated with 15 nm of gold-palladium alloy and were observed in a JXA- 840 Model JEOL scanning electron microscope, to explore the coating of the PCC and Nanoclay in the paper surface on a microscopic level.

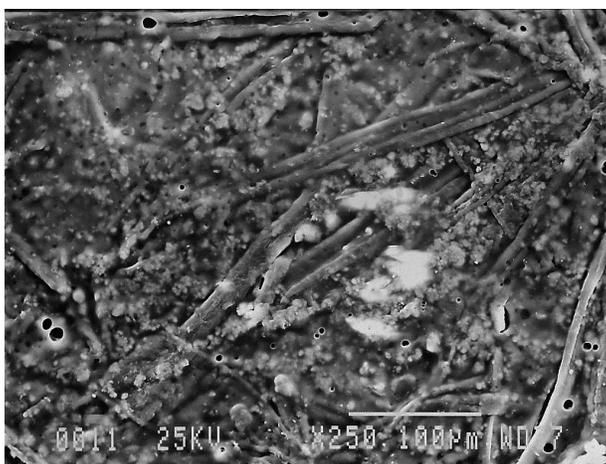
## RESULTS AND DISCUSSION

### Scanning Electron Microscopic (SEM) Study of the Paper Precipitated Calcium Carbonates and Nanoclay

SEM images of the original PCC (Fig. 1). It seems that the scalenohedral shape of the PCC crystals is still preserved. However, the crystals are not as “clean” and well-shaped as those of PCC, which must be due to the presence of a coating at their surface. Thus, these results seem to indicate that a dense and thin film of PCC must have been formed at the surface of the PCC particles.



**Figure 1.** SEM images of paper coated with PCC.



**Figure 2.** SEM images of paper coated with Nanoclay.

### Conclusions

The results showed microscopic view images PCC led to greater uniformity of the paper surface was used. This shows that up to 50 percent of these materials can be used.

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