

(a) Unbent

(b) Bent (inside bend)

(c) Bent (outside bend)

Fig. 11—Photomicrographs of unbent and bent coated paper

so for the former, especially on the inside of the bend. The heavyweight papers showed greater increase than the lightweight papers.

Effect of bending on Taber stiffness

Initial stiffness as measured on the Taber stiffness tester decreased in all cases because of bending, more so for cross-direction bending. The decreases ranged 30–70 per cent.

Effect of bending on curl

Back edge curl and curl in general are well known to printers; they are caused by stress concentration and bending at the point of peel and are effects associated with secondary creep.^(7,11) We found that mechanical bending caused curl in the bending direction and that treated papers immediately rolled up into cylinders

(Fig. 10). The diameters of these cylinders decreased as the treatment increased and are given in Table 5. When plotted against the number of bends, these diameters yield a remarkably smooth curve.

Photomicrographs of paper surfaces

Illustrated in Fig. 11 are photomicrographs of the unbent coated paper surface and convex and concave surfaces after bending. Glancing incidence was used. The convex side shows undulations in the coating apparently arising from the flexing of the fibres beneath the coating, but no fractures are visible. Thus, the coating and adhesive would appear to have reasonably high resistance to tensile failure on bending. The concave side of the bend shows quite marked micro-folds and micro-fractures parallel to the line of the bend. The coating and adhesive would appear, therefore, to have low resistance to compressional failure on bending. These results show that partial failure in coatings (that is, in coating adhesives) can occur long before complete rupture (picking) of the coating.

Conclusions

FROM these results, it is possible to draw conclusions that may have practical importance. The Instron tests, the back edge curl effect shown by the filming of the printing process and the interesting effect of alternate heavily printed bands (Fig. 12) all show that printing can effect paper properties and they indicate

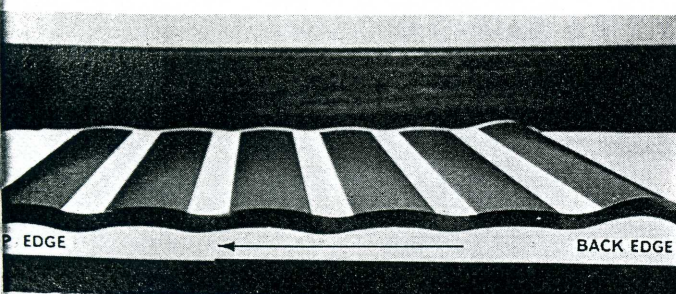


Fig. 12—Curl of paper produced by printing and peeling