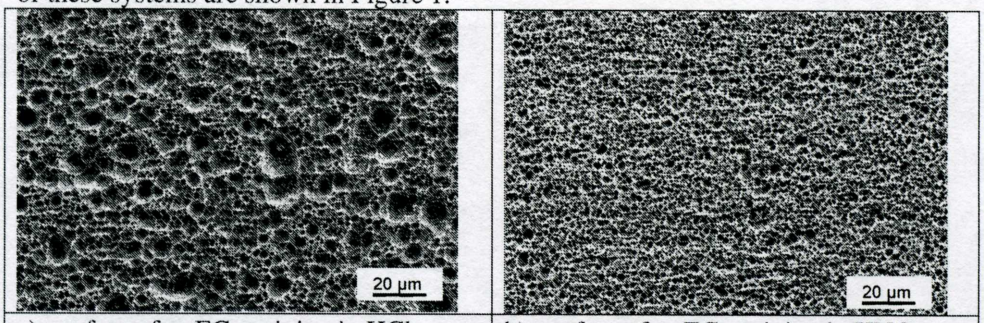
Aluminium for lithographic applications

Introduction

Offset printing has established itself as the dominant printing process for a large range of printing applications including newspapers and magazines. In offset printing, an ink-containing solution and a water-containing solution are simultaneously applied to a printing plate surface whereby the ink is adhering to the oleophilic areas, and the water-containing solution is taken up in the hydrophilic areas and hence the ink is rejected in these areas. All printing plates are made with aluminium as a substrate material, except for a few niche offset printing applications. The choice for rolled aluminium is due to the fact that its oxide is hydrophilic, it is low cost in comparison with alternative substrate materials that can meet the stringent flatness and surface condition requirements, and that it has a high recycling value. The rolled aluminium from which printing plates are made has a typical thickness of 0,3 mm and is known as lithographic strip. The market for lithographic strip is about 500.000 tpy, with an annual increase of about 2-3%. Hydro Aluminium is the leading supplier for lithographic strip with market share of over 30% [1].

Printing plate manufacturing and offset printing

The typical steps in printing plate manufacturing consists of; cleaning, graining, anodisation, post anodic treatments, coating with a photosensitive layer, optionally followed by a baking process for hardening the coating [2, 3, 4]. In cleaning, usually an alkaline etching, residual contaminations and the natural oxide skin of the aluminium surface are removed. In graining the aluminium surface is roughened to a well-defined topography. Nowadays electro-chemical graining (EC-graining) has replaced mechanical graining due to the finer and more defined topographies that can be obtained with the former. EC-graining is performed in acidic electrolytes, based on either hydrochloric acid or nitric acid. The surface topography after EC-graining consists of hemispherical pit-type craters with depths in the order of in the order of 2µm to 10 µm, and is needed to ensure a good adhesion of the coating and to improve the water retentive properties of the surface. The typical surface topographies for both of these systems are shown in Figure 1.



a). surface after EC-graining in HCl. | b). surface after EC-graining in HNO_3.

Figure 1. Surface morphology after EC-graining in HCl and HNO_3.