

INTRODUCTION

Early SAW device performance suffered due to acoustic wave reflections off the backside of the substrate. A coarse backside surface finish was found to reduce these undesirable reflections and became a standard feature of SAW substrate specifications.

As SAW device design and manufacturing methods evolved, optional methods of reducing bulk wave reflections were developed so that a coarse substrate backside is not always necessary. The trade-offs between coarse substrate backside and other important wafer parameters are discussed below.

AVAILABLE BACKSIDE SURFACE FINISHES

Commercially available backside surface finishes can be broadly described as falling into one of the following categories.

DESCRIPTION	ROUGHNESS AVERAGE, Ra
Coarse Lapped or Sandblasted	>0.3 microns
Fine Lapped	0.1 to 0.3 microns
Mirror Polished	<0.001 microns

The Rt value (equivalent to P-V, or peak to valley difference) is typically on the order of 10 times the Ra value.

The specification for backside finish is often stated in terms of the abrasive type/size to be used to lap the surface; for example, GC1000. However the surface finish is not only a function of the abrasive used, but also of the lapping methods employed by the substrate manufacturer. We recommend that the backside surface specification be stated in terms of an acceptable range of Ra values.

EFFECT ON SUBSTRATE BOW

Lapping creates micro-cracks in the substrate surface which laterally expand the surface. A polished surface is not expanded by micro-cracks. Thus a coarse backside on a thin substrate will make a concave contribution to substrate bow.

Whenever possible, backside Ra values greater than 0.3 microns should be avoided for substrates thinner than 0.5mm.

OTHER CONSIDERATIONS

Substrate Cleanliness

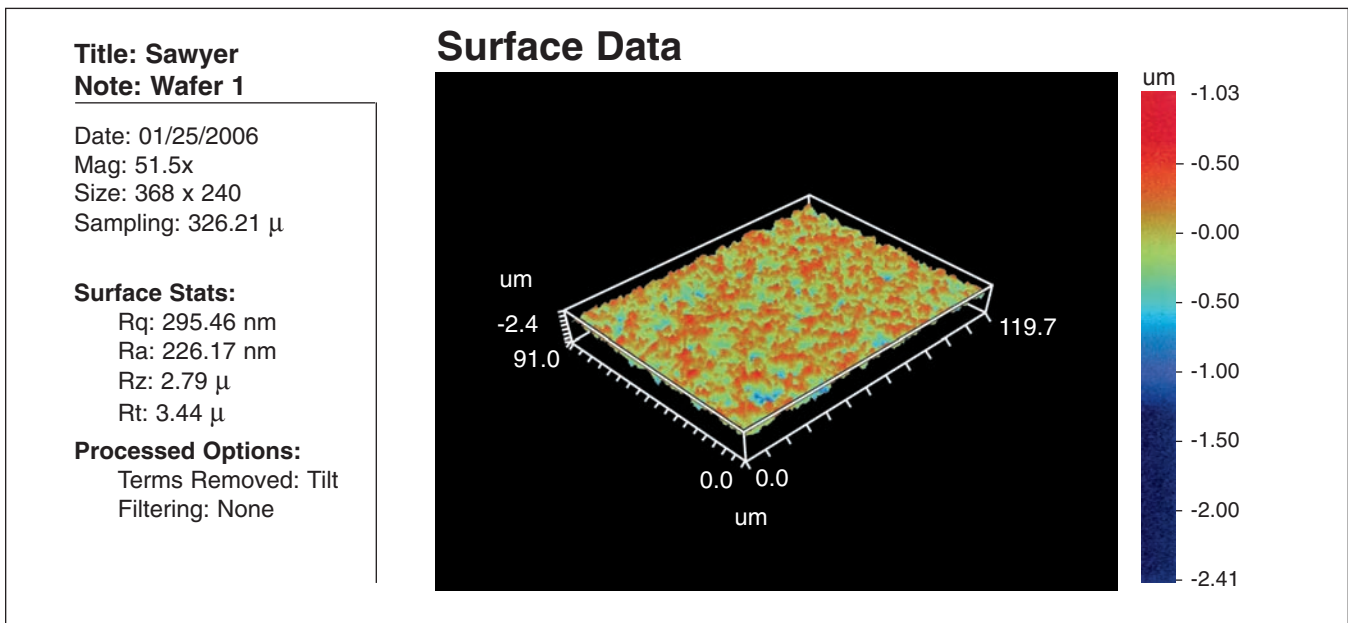
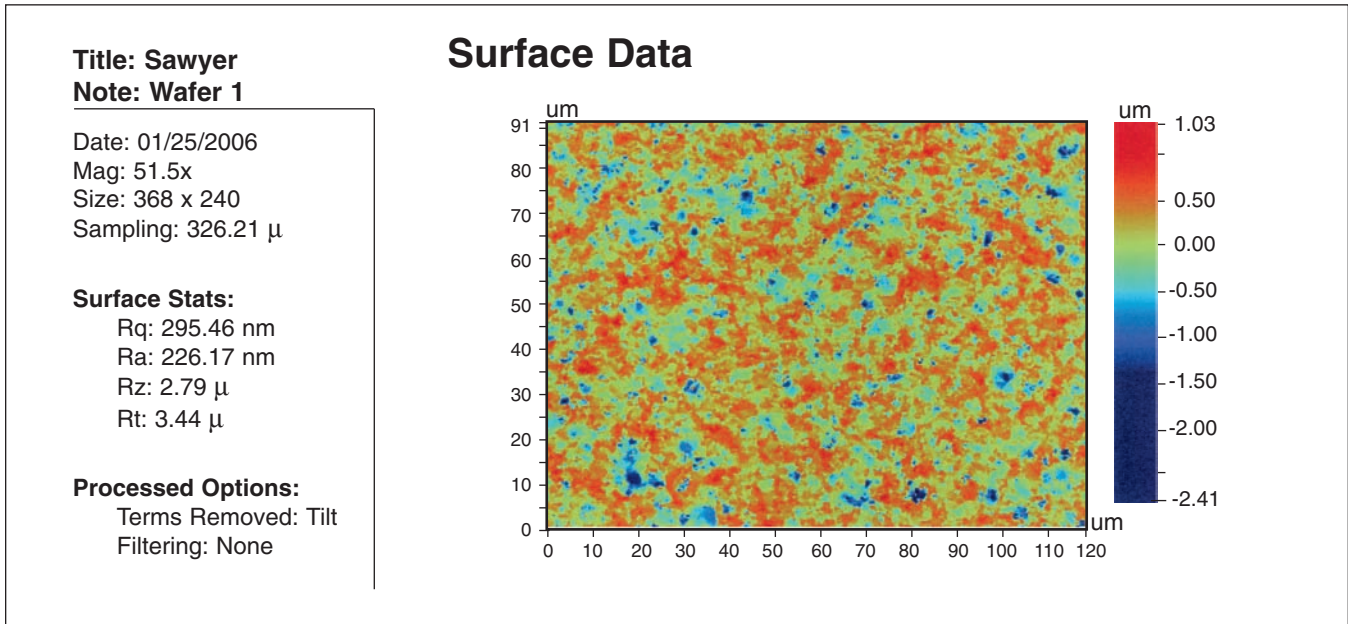
The peaks and valleys are several microns in size for a coarse lapped backside making it a greater cleaning challenge than a fine lapped or polished backside.

Optical Reflectivity

During SAW pattern exposure, light reflection of a fine lapped backside is diffused. For this reason some SAW device manufacturers prefer (require) a fine lapped backside to a polished backside.

METHODS OF MEASUREMENT

We prefer the use of optical, non-contact methods to characterize the surface texture of the SAW substrate backside. Fast, accurate three dimensional displays are obtainable (see the surface data plots below). Some mechanical stylus instruments have stylus diameters too large to accurately track fine lapped surfaces having Ra values as low as 0.1 microns.



Data From Veeco WYKO NT2000

Revised: April 2006