Specimen Preparation for Condoms
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Introduction
Specimen preparation techniques for Scanning Electron Microscope (SEM) imaging of condoms as reported by Rosenzweig et al [1] revealed a variety of artifacts. The artifacts were classified as ridging [2], cracking and melting. The purpose of this article is to introduce a simple specimen preparation technique for condoms to be evaluated via SEM without any surface artifacts. This technique involves the use of two chrome washers to sandwich the condom. The sandwiched condom specimen is then subjected to coating before mounting on an aluminium stub. The execution of this technique requires patience and practice so as not to damage the condom. The method may be applied to any similar polymer material.

Experimental
Different brands of commercial lubricated condoms were purchased for this study. Initially, a circular test specimen was cut with a 32mm circular die from each condom sample. The circular condom specimens were then immersed in isopropanol at room temperature for 10 seconds with gentle rubbing before drying in an oven at 40°C for half an hour.

The washed condom specimens were prepared and analyzed as follows: 1) the specimen preparation technique reported in Rosenzweig et al [1] and 2) a new specimen preparation technique described as follows: The washed condom specimen was mounted without stretching on a chrome washer that had a double-sided conductive carbon tape applied to its surface. The other side of the washed specimen was then attached to another chrome washer that also had a double-sided conductive carbon tape on its surface. This assembly was then sputter coated for 2 minutes at 25 mA with gold-palladium. All coatings from the specimen preparation techniques 1) and 2) were conducted on an Emitech K550X Sputter Coater. The coated assembly was then mounted on an aluminium stub as shown in figure 1. SEM analysis was performed at 15kV accelerating voltage in a Hitachi S 3000N SEM.

Results
The condoms from the different manufacturers were viewed at different magnifications of 70×, 500×, 1000× and 1500× at 60 degree tilt. A pore of one of the condom was viewed at 3000× and 5000× at 60 degree tilt. Artifacts were observed in the samples prepared using the specimen preparation technique reported by Rosenzweig et al [1] as shown in figures 2, 3 & 4.

No artifacts were observed on any samples prepared utilizing the new specimen.
preparation technique. Figure 5 shows the surface morphology of
the condom from Manufacturer A at a lower magnification (70×)
with no surface artifacts. Figure 6 (Manufacturer B). Figures
7 & 8 (Manufacturer C) show the surface morphology of the
condoms at medium (500×) and high (1000×) magnifications.
Figure 9 reveals the pores on the condom of manufacturer C at
a magnification of 3000×.

Discussion

This simple technique has been shown to eliminate the
surface artifacts reported in [1], thus making the viewing of
ultrathin condom films under SEM possible. The suspension of
the condom specimen between the chrome washers has essen-
tially eliminated the artifacts [1] due to the mounting process.

The assessment of condoms under the SEM using this sample
preparation technique has indeed helped to advance research and
developmental work through an understanding of the surface
characteristics of condoms.

Acknowledgment

The author would like to thank Ngui Chih Lipp, Director
of Analytical Services, Science & Technology Innovative Centre,
Ansell Shah Alam Sdn Bhd for his invaluable advice and assis-
tance necessary to complete this work.

References