Agilent Nonstick O-Rings for Superior Performance and Improved GC Inlet Maintenance

Technical Overview

Introduction

The nonstick plasma technology used to pretreat Agilent Premium Septa is also applied to Agilent inlet liner O-rings. Although changing the injection port liner should be a quick maintenance procedure, sticky O-rings are a source of irritation leading to a potential maintenance problem. When the O-ring sticks to the liner and the metal inlet sealing area, it is not uncommon to use excessive force to try to free the liner from the inlet, possibly leading to liner breakage before it becomes loose enough to extract. See Figure 1.

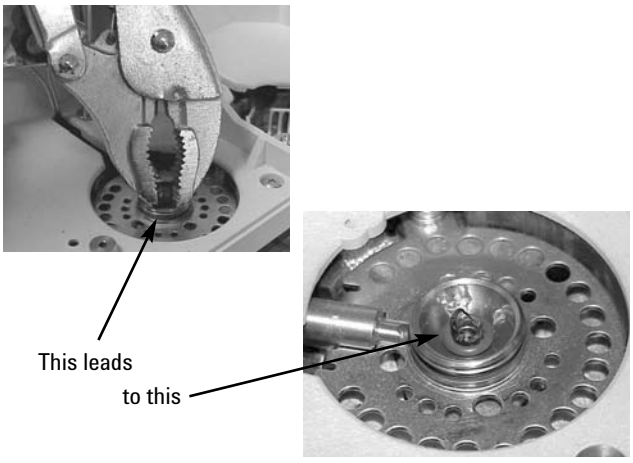

Figure 1. Use of excessive force to remove inlet liner can lead to liner breakage.

The normally one-minute routine maintenance task now becomes a frustrating 30-minute inlet repair job. Using the Agilent nonstick O-ring alleviates this concern. Since one reason for changing the liner is to remove contaminants, changing the liner frequently will reduce system background noise and help ensure quantitative transfer of all solutes to the column. Additionally, active solutes may absorb or break down inside a used contaminated inlet liner, which means routine replacement of the liner is required to ensure accurate and reproducible results.

Experimental

Tests performed against other brands of O-ring and nontreated Agilent O-rings demonstrated the effectiveness of the plasma treatment. Using a specially designed test jig, several brands of O-rings were tested to see if stickiness was inherent in any of their final products. Figure 2 shows the test jig loaded with O-rings and liners. It consists of two stainless steel plates with holes and mating surfaces machined to the same specifications as the Agilent Split/Splitless injection port. When the liners and O-rings were in place, the two plates where bolted together to ensure that the same pressure was distributed around all of the liners and O-rings. This plate was then placed inside a vacuum oven to ensure that no oxygen was present (to eliminate oxidation of the polymeric O-ring) and heated to simulate normal inlet operation temperatures and left for a period ranging from 24 hours to as long as 2 weeks.

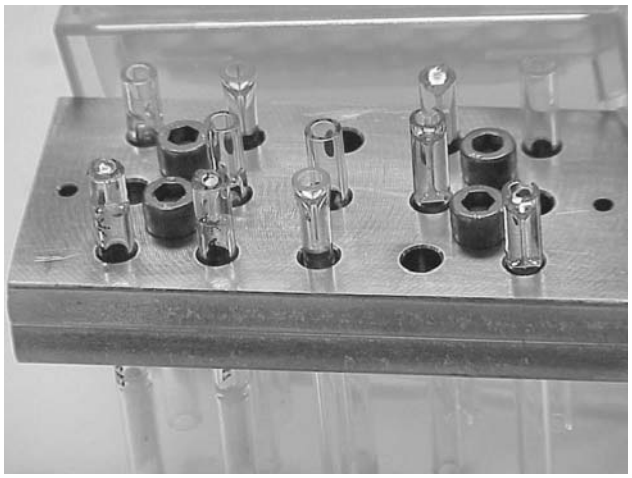

Figure 2. Liner O-ring test jig – top view.

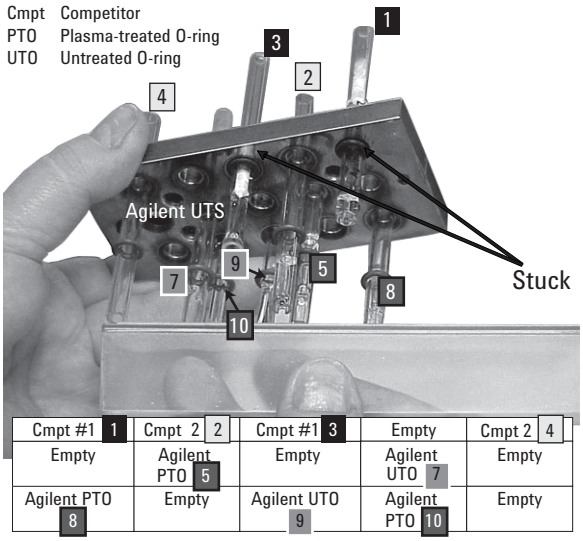

Figure 3. Demonstration of stuck and loose inlet liners after heating.

After the test jig was removed from the oven, it was allowed to cool to room temperature and then disassembled (Figure 3).

While it is inaccurate to say that every nonplasma-treated O-ring stuck, it is accurate to state that during one or more tests, every one of the different brands of nontreated O-rings did experience some degree of sticking to the liner, the metal surface, or both. However, the most significant result was that all Agilent plasma-treated O-rings (PTO) did not stick at all.

The plasma treatment also has a positive affect of removing background impurities from the surface of the O-rings. Figure 4 demonstrates the improvements that the plasma treatment has on the O-ring outgassing impurities.

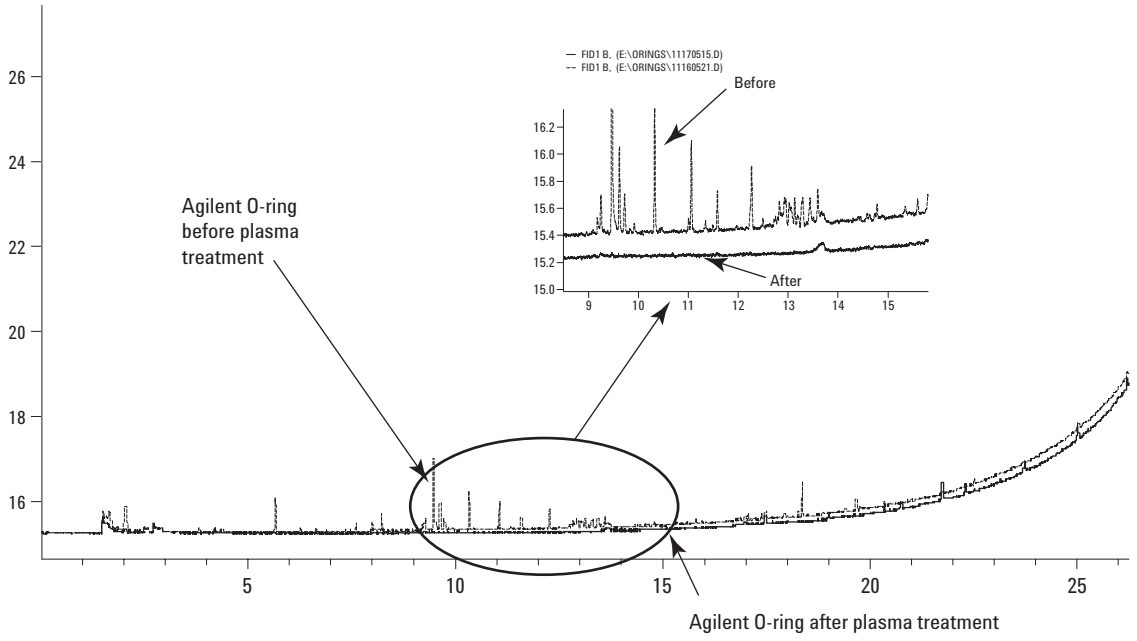

Figure 4. Chromatographic comparison: Agilent plasma-treated O-ring versus Agilent untreated O-ring from a box.

Agilent packages the O-rings in decontaminated dial packs (Figure 5) that allows a single O-ring to be dispensed without the worry of other O-rings falling out of the pack. (p/n 5180-4182, PTO Nonstick O-rings, 10/package)

The nonstick O-rings also have a cleaner background than other O-rings packed in the competitor's packing (Figure 6).

Figure 5. Package of Agilent plasma-treated O-rings. (p/n 5180-4182)

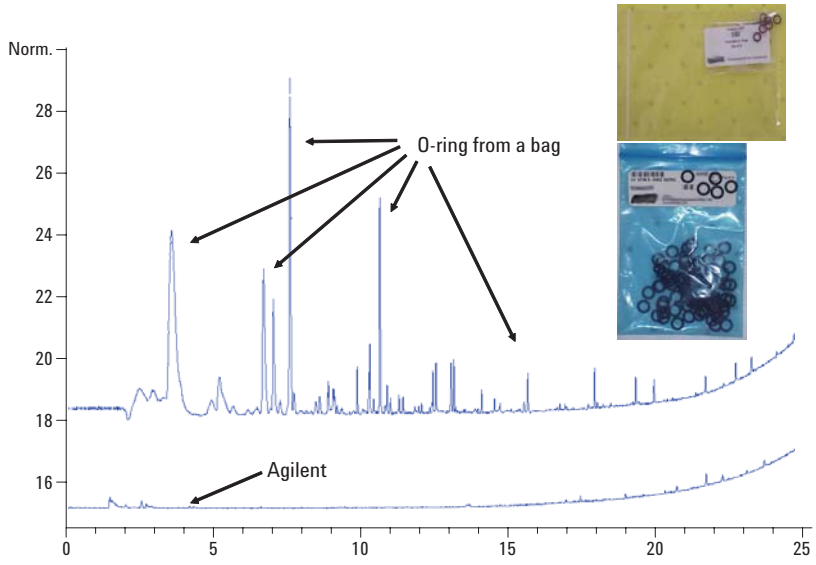

Figure 6. Chromatographic comparison of Agilent disk-packed and competitor's bagged O-rings.

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