Sample Degradation/Damage During XPS Analysis (June 1988)
Non-Monochromatic Mg source vs Monochromatic Al source

The rate and nature of the damage caused by non-monochromatic X-ray sources are different than those caused by monochromatic X-ray sources. The reason is that the Non-Mono source also produces heat (100-200 C) and high energy X-rays (up to 12 KeV) - also known as Bremmstrahlung. Damage is due to loss of elements and bond rearrangement. Bulk was freshly exposed using freshly cleaned razor blade. Note: Non-mono sources (300-600 W) are usually only 3-5 cm away from the surface of a sample.

Polymer Tested	Atom% Ratio	Non-Mono 12 hr exposure	Mono 14 hr exposure
Poly Iso-hexene	C/C*	---	+6%
Poly Ethylene (HDPE)	C/C*	---	+4%
Poly Styrene (PS)	C/C*	---	+3%
Poly Butene	C/C*	---	+3%
Poly Acrylonitrile (PAN)	N/C	-28%	+1%
Poly Imide (Kapton®)	O/C	-20%	-1%
Poly Ethylene terephthalate (PET, Mylar®)	O/C	-13%	-3%
Poly Phenylene Sulfide (PPS)	S/C	---	-3%
Poly Carbonate (PC)	O/C	---	-7%
Poly Sulfone	O/C	---	-8%
Poly Methyl Methacrylate (PMMA)	O/C	---	-15%
Poly Vinyl Acetate (PVA)	O/C	---	-17%
Poly Acetal	O/C	---	-18%
Poly Caprolatam (Nylon 6®)	N/C	-55%	-20%
Poly Vinylidene di-Fluoride (PVdF)	F/C	---	-21%
Poly Acrylic Acid (PAA)	O/C	---	-25%
Poly Tetrafluoroethylene (PTFE, Teflon®)	F/C	---	-28%
Poly Vinyl Chloride (PVC)	Cl/C	---	-49%
Nitro Cellulose (Whatman filter paper)	N/C	-50% (1.8 hr)	-57% (6 hr)

Phenyl rings, nitriles and hydrocarbon systems lessen the damage caused by monochromatic X-rays due to unsaturation. Research by others verifies this behavior.

*The positive (+6%) value for pure hydrocarbons is due to the formation of double bonds ($sp^3 \rightarrow sp^2$).