P7 | **Study on the surface microstructure of the aged silicone rubber composite insulators by PALS**

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The silicone rubber composite insulators are being increasingly used instead of porcelain or glass for outdoor insulation application. In this paper, the variations in surface microstructure of polydimethylsiloxane (PDMS) elastomers after argon plasma treating for different time have been investigated by X-ray photoelectron spectroscopy (XPS), slow positron beam and scanning electron microscope (SEM). Inorganic silica-like layer was probed by XPS, after 3 min or longer time of treatments. By using slow positron beam, the thicknesses of silica-like layer for 3 min, 5 min, and 10 min aged samples were estimated as 26 nm, 28 nm and 80 nm, respectively. Among these 3 min and 5 min treated samples, the peak height in S(E) curve increased, indicating the accumulation of low molecular weighted (LMW) siloxanes beneath silica-like layer due to its blocking effect. However, the S(E) curve peak height of 10 min treated sample decreased dramatically. The result suggested that the silica-like layer cracked after long time of plasma treatment, and LMW oligomers diffused through these cracks. SEM images revealed that inorganic fillers were also exposed after 10 min of treatment, indicating the removing of polymeric sample surface. Then the silica-like layer grows thicker. Whereas, short time (≤3 min) argon plasma treatments can only remove surface preexisting LMW siloxanes and induce a few PDMS chain scission reactions on the sample surface.

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