Supporting Information

Migration Behavior of Lubricants in Polypropylene Composites under Accelerated Thermal Aging

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Table S1. XPS surface element analysis data of polypropylene/lubricants composites aged at different temperatures and 100% humidity.

Mg	**Chemical Composition (%)**			**Atomic Ratio**		**Binding Energy (eV)**
	C	**O**	**Mg**	**O/C**	**Mg/C**	C-C (285)
20 °C	96.52	3.48	-	0.040	-	C=O (287.6)
50 °C	96.85	3.15	-	0.032	-	C-OH (286.1)
70 °C	97.31	2.69	-	0.027	-	C-O (532)
90 °C	98.65	1.19	0.16	0.012	0.002	O=C-O (534) MgO (1304)
Ca	**Chemical Composition (%)**			**Atomic Ratio**		**Binding Energy (eV)**
	C	**O**	**Ca**	**O/C**	**Ca/C**	C-C (285)
20 °C	94.53	5.47	-	0.058	-	C=O (287.6)
50 °C	93.51	5.30	1.19	0.056	0.013	C-OH (286.1)
70 °C	92.6	5.35	2.05	0.052	0.022	C-O (532)
90 °C	95.41	4.59	-	0.048	-	O=C-O (534) CaO (347, 351)

Table S2. Roughness parameters of thermal aged polypropylene/lubricant composites by AFM on images of 20 um × 20 um.

Composites	Aging temperature (°C)	Root mean square roughness, RMS (nm)	Mean roughness, Ra (nm)
Polypropylene/Mg	20	47.11	41.04
	50	77.01	59.50
	70	87.76	74.51
	90	195.56	165.62
Polypropylene/Ca	20	208.45	148.25
	50	397.34	314.55
	70	214.73	181.57
	90	179.36	148.01