Preparation of sulfomethylated softwood kraft lignin as a dispersant for cement admixture

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Supporting information

S1-Table S1 lists the raw data for the charge density determination of OSKL, which was produced under the conditions of 100℃, time of 1 h, and a nitric acid concentration of 20 wt.%.

Table S1. Raw data for charge density analysis of OSKL analysis

Samples	PVSK concentration, M	Volume, mL	OSKL, g	Charge density, meq/g
OSKL	0.005	7.74	0.01	3.87

OSSKL was produced under the conditions of 100 ºC, 3 h, 1/1 HCHO to lignin and 0.5/1 $Na_2S_2O_5$ to lignin molar ratios. Table S2 lists the raw data for the carboxylate and sulfonate group analysis of OSSKL.

Table S2. Sulfonate and carboxylate group analyses via titration using DDMICI at 0.0055 M concentration and with 0.01 g lignin (oven dried).

Samples	Volume, mL	Carboxylate group, meq/g	Sulfonate group, meq/g
OSKL	E_2: 5.52	1.69	0
OSSKL	E_1: 2.45	0	1.35

In Table 2S, E_1 is the volume of DDMICI standard solution used for the sulfonation degree analysis and E_2 is the volume of DDMICI standard solution used for carboxylate group analysis.

Figure S1 (left) shows the titration curves of sulfonate group analysis and Figure S1 (right) shows the titration curves of carboxylate group analysis of OSSKL, respectively. In this figure, the blue line shows the U and red line show the ERC. U is potential of titration (mV), and ERC is abbreviation of equivalence point recognition criterion.

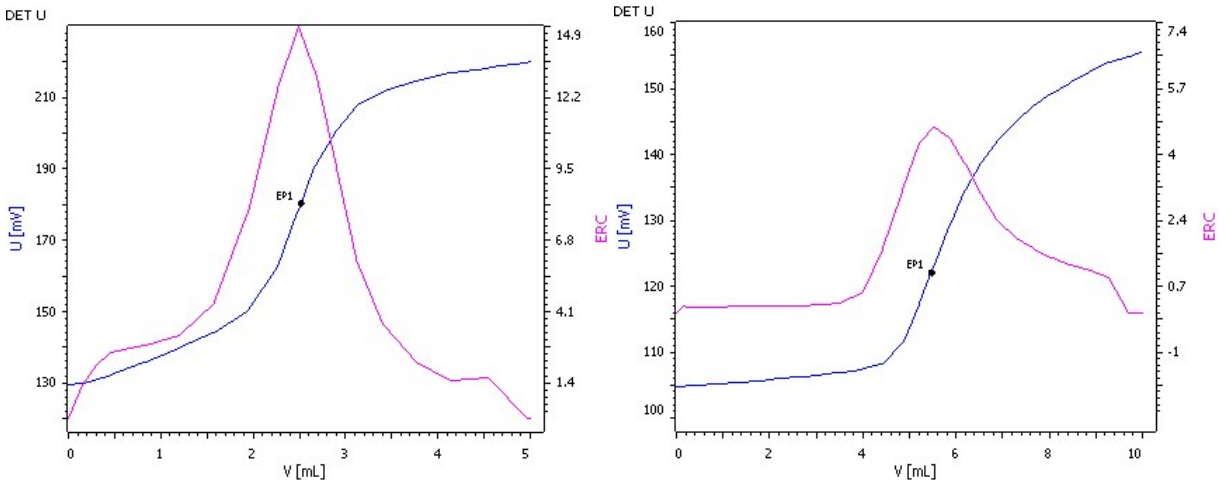

Figure S1. Potential and equivalence point recognition for sulfonate group (left) and carboxylate group (right) analyses of OSSKL

S2-GPC analysis

Figure S2 shows the refractive index of GPC analysis as a function of time using viscometer and RI detectors. In this figure, it is observable that SKL had a broad MW, due to its board retention time in the GPC column. However, the elution time was shorter for the modified lignin samples. The SLS and LASS had long elution times, which imply that their molecular weight distributions were board.

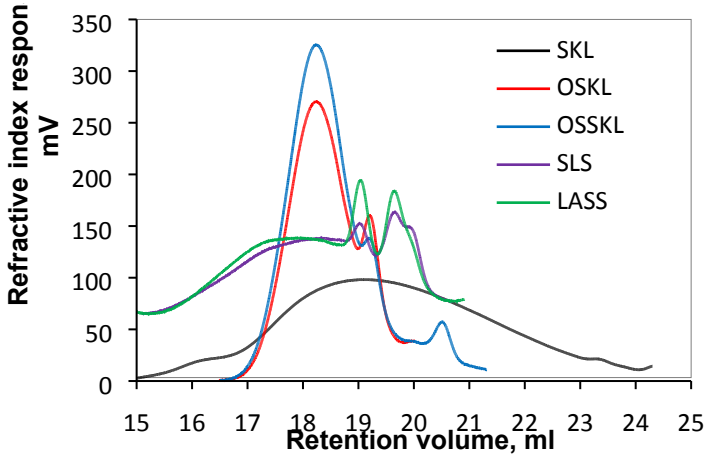

Figure S2. Chromatograms of samples of lignin