Electronic Supplementary Material (ESI) for RSC Advances.
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Supporting Information Cover Sheet

Development of carbon adsorbents with high surface acidic and basic group contents from phosphoric acid activation of xylitol

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Submitted to RSC advances

Number of pages: 5

Number of tables: 1

Number of figures: 2

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Table S1. Langmuir isotherm constants for the nickel adsorption onto the carbons.

	C-250	**C-300**	**C-350**	**C-450**	
Q_m (mg/g)	14.1	11.8	9.9	9.8	
K_L (L/mg)	0.0999	0.0666	0.0518	0.0679	
R^2	0.9982	0.9938	0.9892	0.9929	
	AC-250-1.5	**AC-300-1.5**	**AC-350-1.5**	**AC-450-1.5**	**AC-PA**
Q_m (mg/g)	52.91	62.89	69.44	64.52	35.2
K_L (L/mg)	0.351	0.376	0.4273	0.303	0.128
R^2	0.9995	0.9986	0.9991	0.9954	0.9988

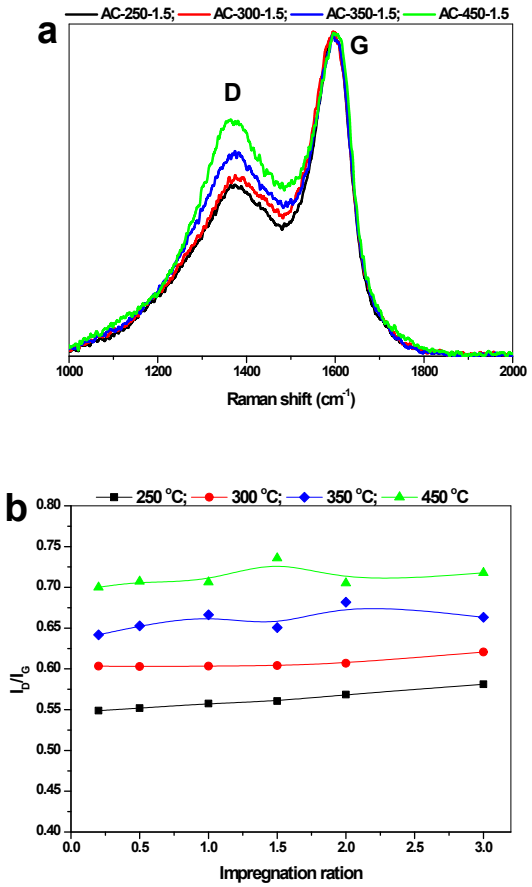

Figure S1. Raman spectra (a) and intensity ratios of D to G bands (I_D:I_G) of the activated carbons (b).

As shown in Fig. S1, Raman spectra obtained in the 1000-2000 cm^{-1} range of the samples were typical spectra of non-graphitic carbonized materials, with two main peaks: D (around 1360 cm^{-1}) and G (around 1590 cm^{-1}), which were characteristics for amorphous carbons or disordered graphite. The relative intensity ratio of the two bands, I_D/I_G, was calculated to evaluate the graphitization or crystallization of carbon materials. The large I_D/I_G values (> 0.55) suggested the low degree of graphitization of the carbon materials. Obviously, with the increase in impregnation ratio and activation temperature, the Raman spectra of resultant AC-X-R samples showed increased intensity of D peak and I_D/I_G ratio, indicating that these carbons became less ordered, which was coincided with previous papers.

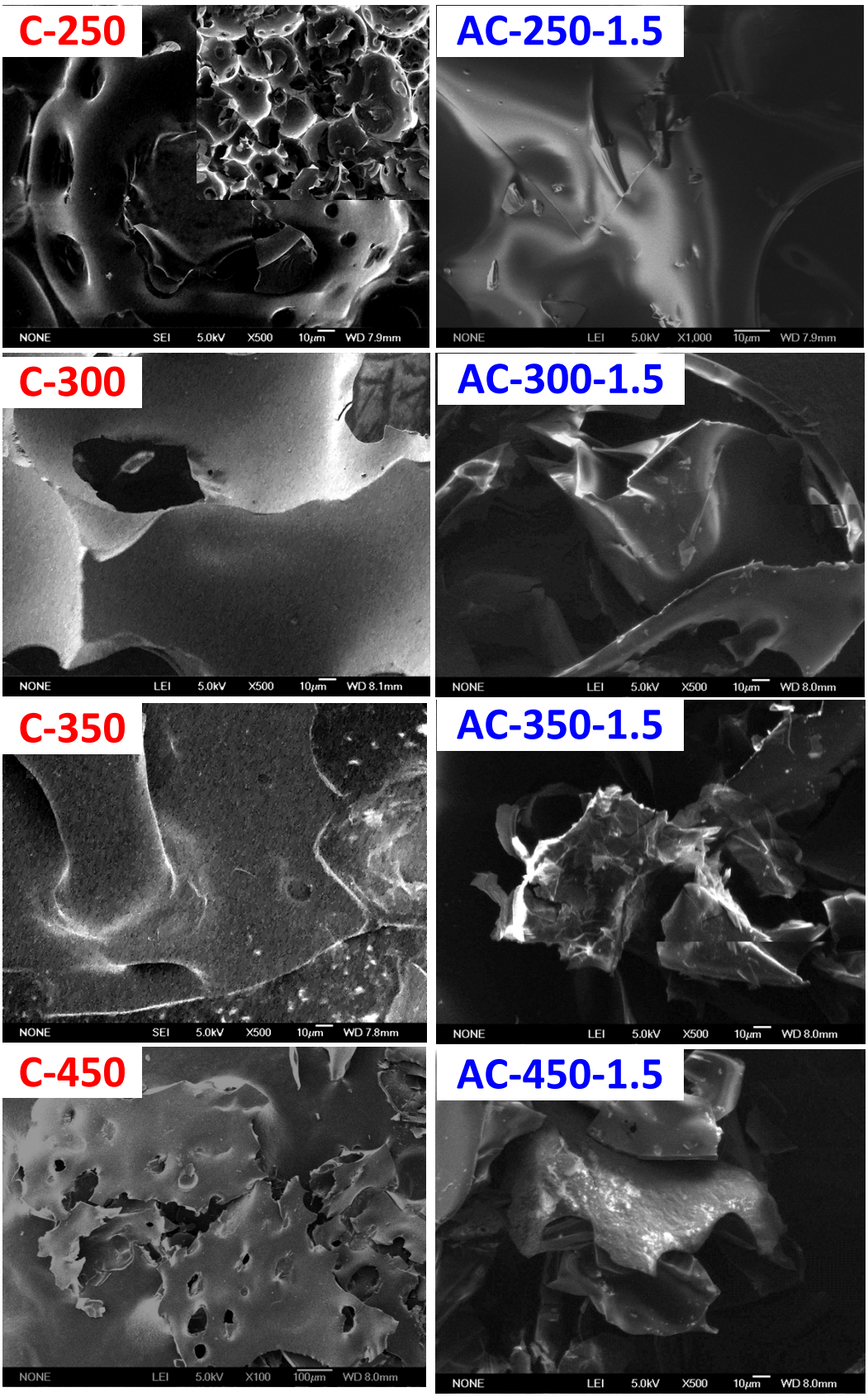

Figure S2. SEM micrographs of carbons prepared with impregnation ratio of 1.5 at different activation temperatures.

SEM images of the C-X and the carbons prepared at different temperatures with an impregnation ratio of 1.5 are shown in Fig. S2. The images showed that the C-X samples had cracked foam-like structures with smooth surfaces. Xylitol was melted at temperature above 93~95 ^{o}C, and the gases generated from pyrolysis of xylitol were erupted to cause cleavage of bubbles (see C-250 sample). It can be observed that as activation temperature increased, these irregular structures were melted and corroded to form completely glossy surface at 450 ^{o}C. For the AC-X-1.5 samples, they exhibited fragmental structure with sharp corners. Esterification and de-esterification were occurred, which was also accompanied with release of many radicals. These radicals finally turned into organic matter, such as esters, alcohols and alkenes. The particles on their surfaces also confirmed the occurrence of decomposition of phosphate esters and the vapor deposition of these organic matters.