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CORRECTION

Correction to: Dye adsorption revisited: application of the cationic dye adsorption method for the quantitative determination of the acidic surface groups of nanocellulose materials

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In the original publication of the article, the author quantified the sulfate and carboxyl group contents in cellulose nanowhisker (CNW) samples obtained from different cellulose sources under various acid hydrolysis conditions using the adsorption of toluidine blue O (TBO). The results were presented in Figure 2 and Table 1 of the original article. The results in the mentioned figure and table of the original article suggested a linear relationship between the functional group contents obtained via conductometric titration and those obtained via TBO adsorption; however, these two measurement results were not identical. Therefore, the author concluded that the TBO adsorption results can be a measure of the content of surface charged groups and be readily recalculated and compared with the conductometric titration results.

After the publication of the original article, the author noted a mistake in the handling of samples during the TBO measurements to obtain the data shown in Figure 2. As described in the Supplementary Information, 0.5 mL of nanowhisker suspension (5 mg/mL) should be used for each measurement to obtain sulfate/carboxyl group contents, both for measurements in water and at pH 1, for sulfate/carboxyl determination (see the section with the heading "*Dye adsorption protocol 2. Determination of the sulfate/carboxyl contents in SCNWs"* in the Supplementary Information). The protocols described in the Supplementary Information were appropriate. However, the author had taken 0.1 and 0.5 mL of the nanowhisker suspension and utilized these for the measurements in water and at pH 1, respectively, as in the section "*Dye adsorption protocol 1. Determination of the carboxyl contents in CCNWs*" in the Supplementary Information. This mistake misconstrued the relationship between the titration and TBO adsorption results.

To revise Figure 2, the author repeated all experiments, including sample preparations, titrations, and TBO adsorptions. The revised Figure 2 is shown below, together with the revised form of Table 1 summarizing the correct sulfate/carboxyl contents in all samples. Although some deviations exist, the newly obtained results approached the

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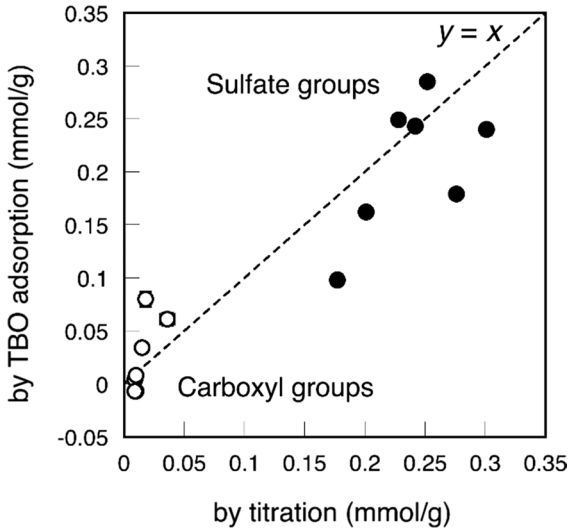

Fig. 2 Comparison of the sulfate/carboxyl contents in CNWs (also presented in Table 1), as determined via conductometric titration and TBO adsorption. Filled circles, sulfate group contents; open circles, carboxyl group contents. The dotted line indicates a linear relationship of $y = x$

linear relationship of $y = x$, which are more corresponding than those in the original publication, *i.e.*, $y = 0.831x$. The latest results also indicate another improvement: The negative values for the carboxyl contents, which were unignorably observed in the previous TBO measurements, almost disappeared (*i.e.*, the two values for C-50C60M and C-60C60M can be regarded as being equal to zero). Such negative value estimations may have also been caused by the sample mishandling referred to above.

Considering the above revisions, the author has exchanged Fig. 2 and Table 1 in the original publication with those shown below. The conclusion previously reached based on the sulfate/carboxyl evaluation via TBO adsorption is also changed as follows: The results obtained from TBO adsorption were comparable with those obtained from conductometric titration. The negative values for the carboxyl contents, which were attributed to their amounts being below the detection limit of the technique in the original publication, were now negligible in the latest TBO adsorption measurements.

The author gratefully acknowledges Miss Minami Nakajima (Shinshu University), who pointed out the sample mishandling during the measurements.

Table 1 Surface sulfate and carboxyl group contents in various SCNWs, as determined via conductometric titration and TBO adsorption, as well as the starting cellulose materials and hydrolysis conditions for each SCNW

SCNWs	Cellulose starting materials	Hydrolysis conditions		Sulfate group content (mmol/g)		Carboxyl group content (mmol/g)	
		Temperature (°C)	Time (min)	By-titration	By TBO adsorption	By titration	By TBO adsorption
C-70C20M	Cotton powder	70	20	0.242 ± 0.001	0.243 ± 0.002	0.009 ± 0.001	0.004 ± 0.001
C-45C30M	Cotton powder	45	30	0.177 ± 0.004	0.098 ± 0.003	0.015 ± 0.002	0.034 ± 0.004
C-45C60M	Cotton powder	45	60	0.201 ± 0.000	0.162 ± 0.002	0.010 ± 0.001	0.008 ± 0.002
C-50C60M	Cotton powder	50	60	0.228 ± 0.000	0.249 ± 0.003	0.010 ± 0.001	− 0.007 ± 0.003
C-60C60M	Cotton powder	60	60	0.252 ± 0.000	0.285 ± 0.002	0.009 ± 0.001	− 0.007 ± 0.003
W-45C60M	MCC	45	60	0.276 ± 0.002	0.179 ± 0.004	0.036 ± 0.006	0.061 ± 0.006
W-70C10M	SBKP	70	10	0.301 ± 0.001	0.240 ± 0.005	0.018 ± 0.001	0.080 ± 0.007