

Title	Can acid pre-treatment enhance biohydrogen and biomethane production from grass silage in single-stage and two-stage fermentation processes?
Authors	Deng, Chen;Lin, Richen;Cheng, Jun;Murphy, Jerry D.
Publication date	2019-05-23
Original Citation	Deng, C., Lin, R., Cheng, J. and Murphy, J. D. (2019) 'Can acid pre-treatment enhance biohydrogen and biomethane production from grass silage in single-stage and two-stage fermentation processes?', Energy Conversion and Management, 195, pp. 738-747. doi: 10.1016/j.enconman.2019.05.044
Type of publication	Article (peer-reviewed)
Link to publisher's version	<a href="http://www.sciencedirect.com/science/article/pii/S0196890419305990">http://www.sciencedirect.com/science/article/pii/S0196890419305990</a> - 10.1016/j.enconman.2019.05.044
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Download date	2024-06-13 16:37:37
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# **Can acid pre-treatment enhance biohydrogen and biomethane production from grass silage in single-stage and two-stage fermentation processes?**

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The supporting information contains 3 figures as referred to in the main manuscript:

Fig. S1. Scanning electron microscope (SEM) graphs of grass silage before and after pre-treatment:

(a) untreated silage  $\times 1k$ ; (b) untreated silage  $\times 10k$ ; (c) silage pre-treated with 2%  $H_2SO_4$  at 135 °C for 15 min  $\times 1k$ ; (d) silage pre-treated with 2%  $H_2SO_4$  at 135 °C for 15 min  $\times 10 k$ .

Fig. S2. Fourier transform infrared (FTIR) spectra of the silage residue before and after pre-treatment.

Fig. S3. X-ray diffraction (XRD) spectra of the silage residue before and after pre-treatment.

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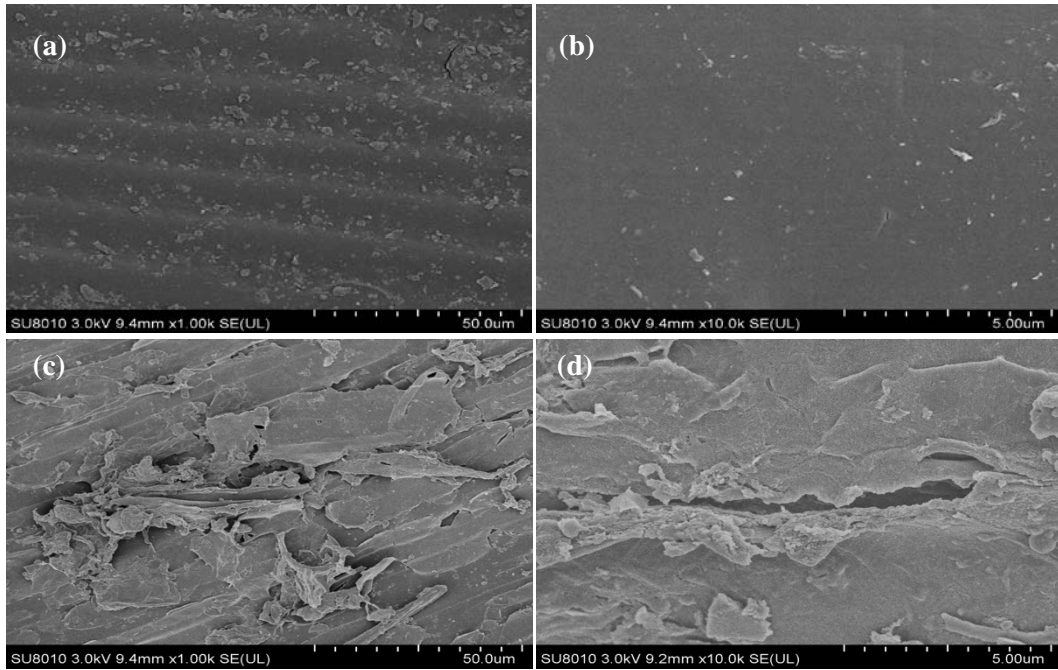


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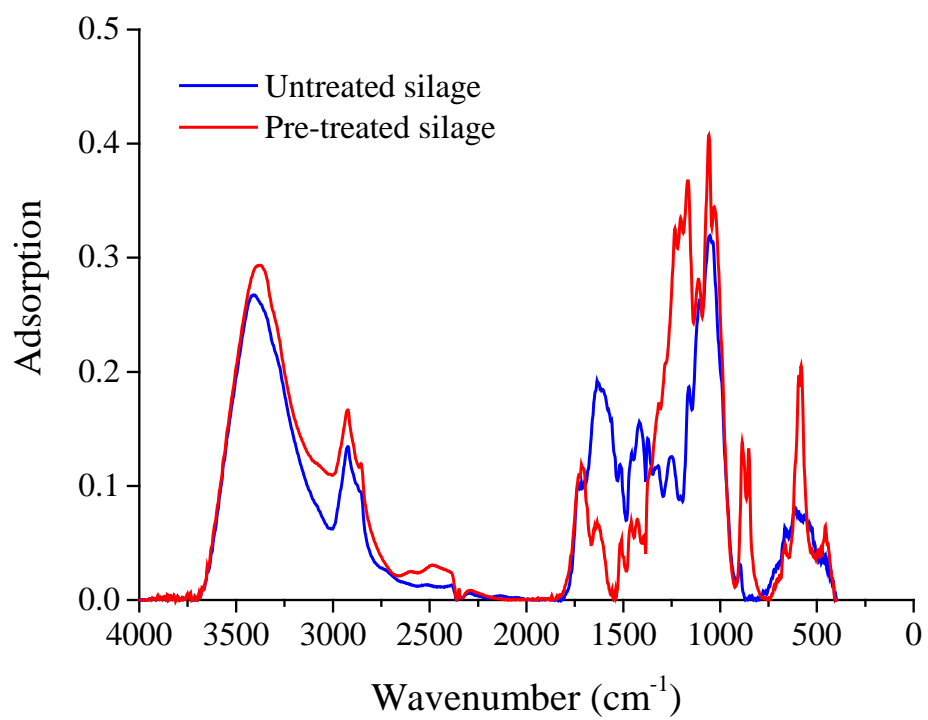


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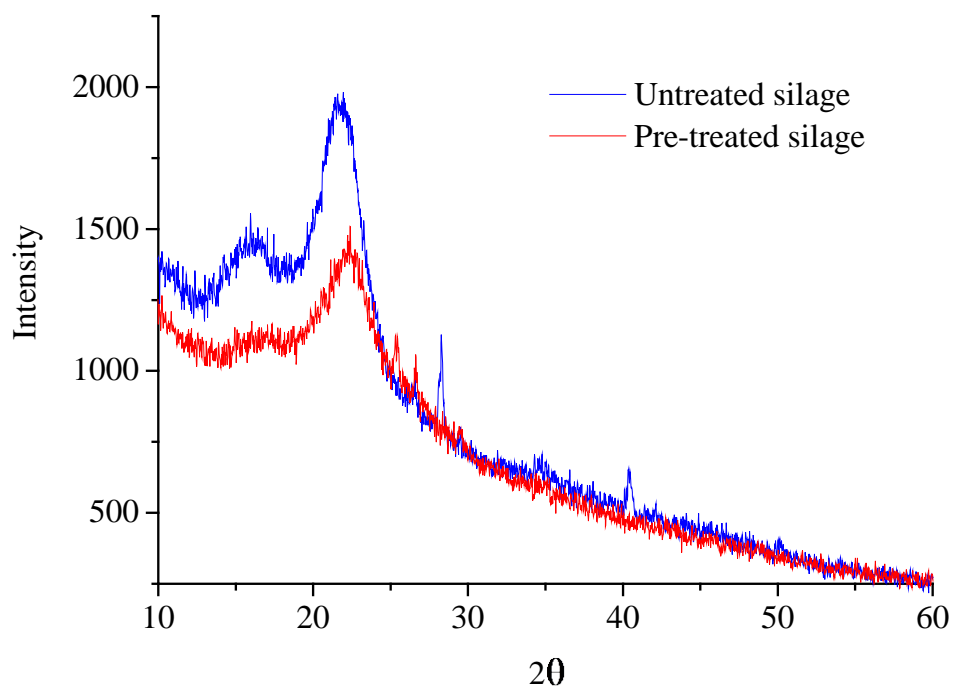


Fig. S3. X-ray diffraction (XRD) spectra of the silage residue before and after pre-treatment.