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Phosphomolybdic acid and ferric iron as efficient electron mediators for coupling biomass pretreatment to produce bioethanol and electricity generation from wheat straw

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1        **Phosphomolybdic acid and ferric iron as efficient electron mediators for**  
2        **coupling biomass pretreatment to produce bioethanol and electricity**  
3        **generation from wheat straw**

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12        **Abstract:** Phosphomolybdic acid (PMo<sub>12</sub>) was used as an electron mediator and proton  
13        carrier to mediate biomass pretreatment for ethanol production and electricity generation from  
14        wheat straw. In the pretreatment, lignin was oxidized anaerobically by PMo<sub>12</sub> with  
15        solubilization of a fraction of hemicelluloses, and the PMo<sub>12</sub> was simultaneously reduced. In  
16        an external liquid flow cell, the reduced PMo<sub>12</sub> was re-oxidized with generation of electricity.  
17        The effects of several factors on pretreatment were investigated for optimizing the conditions.  
18        Enzymatic conversion of cellulose and xylan were about 80% and 45% after pretreatment of  
19        wheat straw with 0.25 M PMo<sub>12</sub>, at 95°C for 45 min. FeCl<sub>3</sub> was found to be an effective liquid  
20        mediator to transfer electrons to air, the terminal electron acceptor. By investigating the  
21        effects of various operation parameters and cell structural factors, the highest output power  
22        density of about 11 mW/ cm<sup>2</sup> was obtained for discharging of the reduced PMo<sub>12</sub>.

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