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Comparative study on different pretreatment on enzymatic hydrolysis of corncob residues

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Introduction

Introduction

木质纤维素生物质是一种丰富的可再生绿色资源，被认为是替代化石燃料的理想可再生替代品。2018年，中国玉米产量为2.57×10^{8}吨，这意味着可生产玉米芯$6.42\times10^{7}\sim7.71\times10^{7}$吨。从玉米芯中去除半纤维素后，发现玉米芯残渣中纤维素含量较高（65.4%）。

Introduction

本研究采用磺化法、PEI机械精制法、湿磨法三种预处理方法对玉米芯渣进行酶解，得到可发酵糖。分析了不同预处理方法对玉米芯渣酶解性能的影响及玉米芯渣底物的主要特性

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Materials and methods

Materials and methods

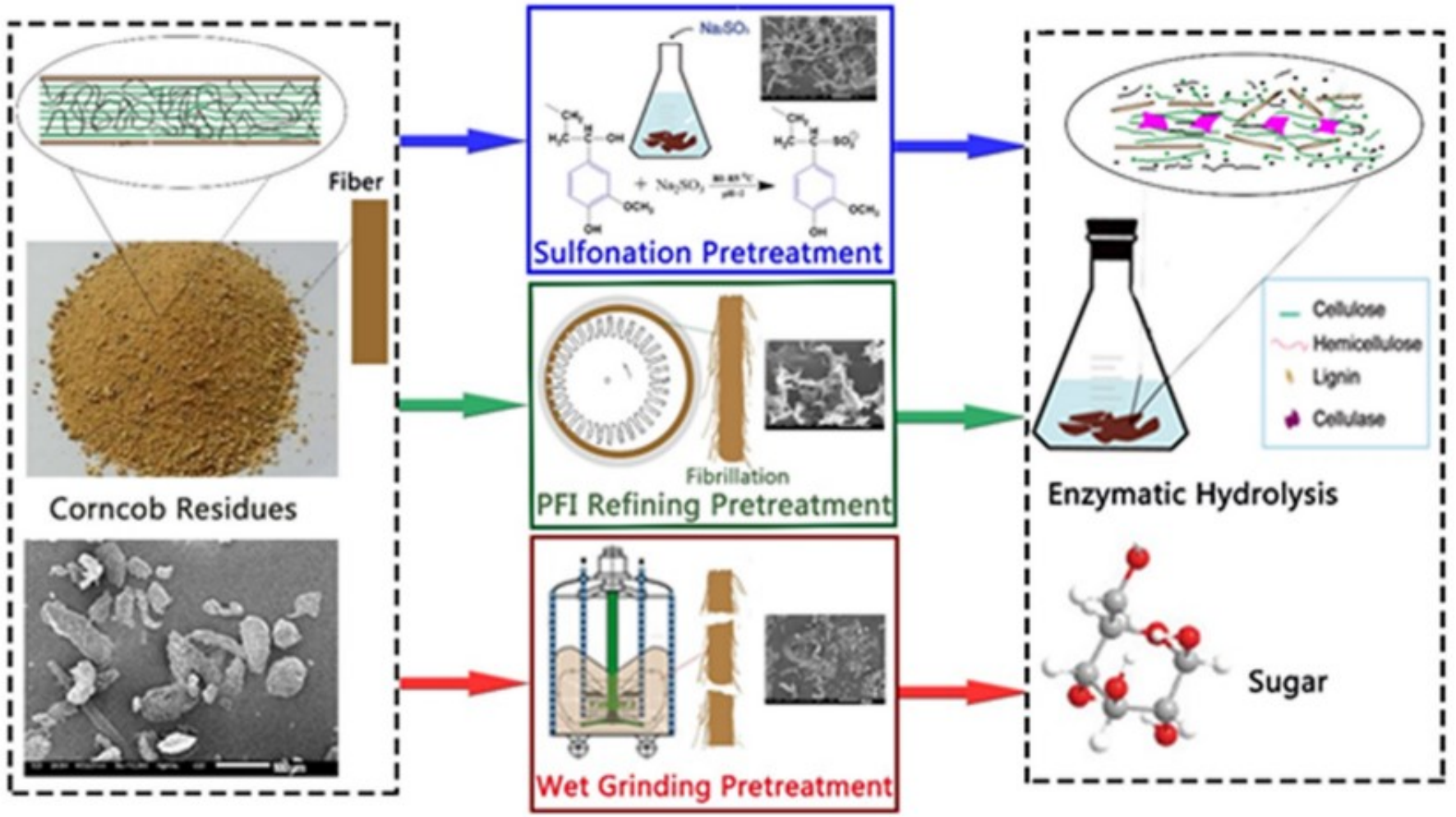

Fig. 1. Scheme of experimental routes.

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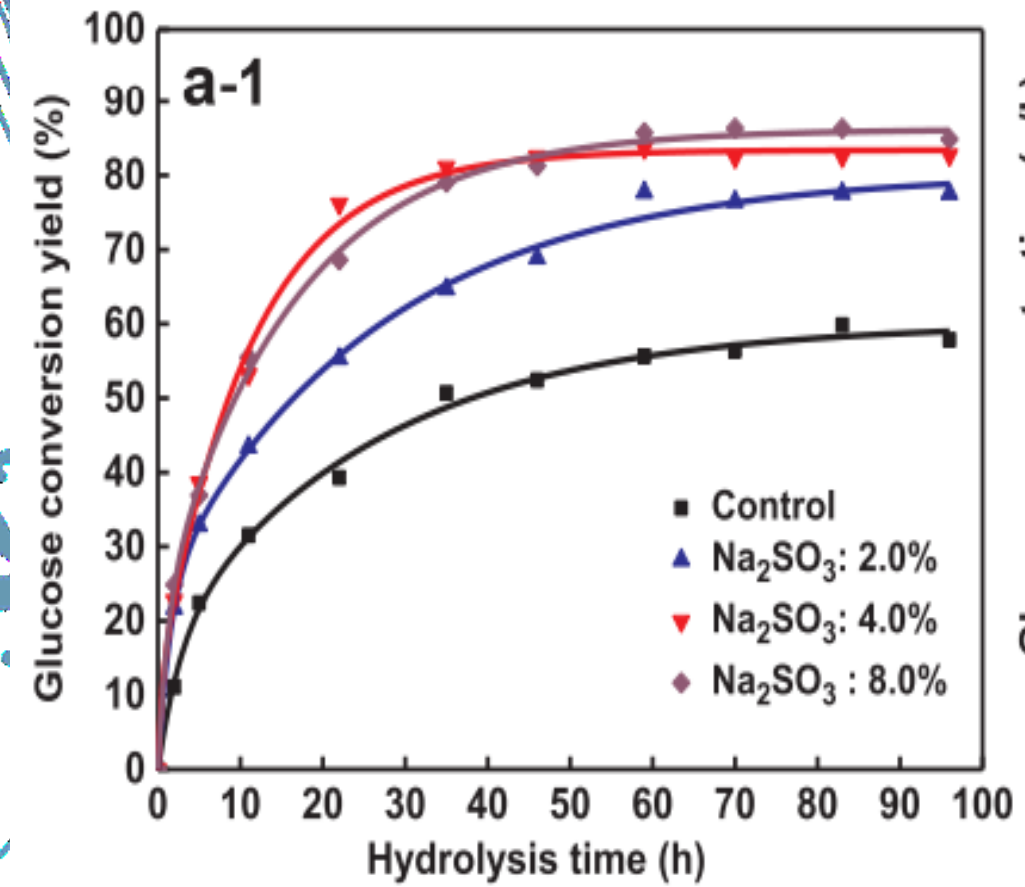
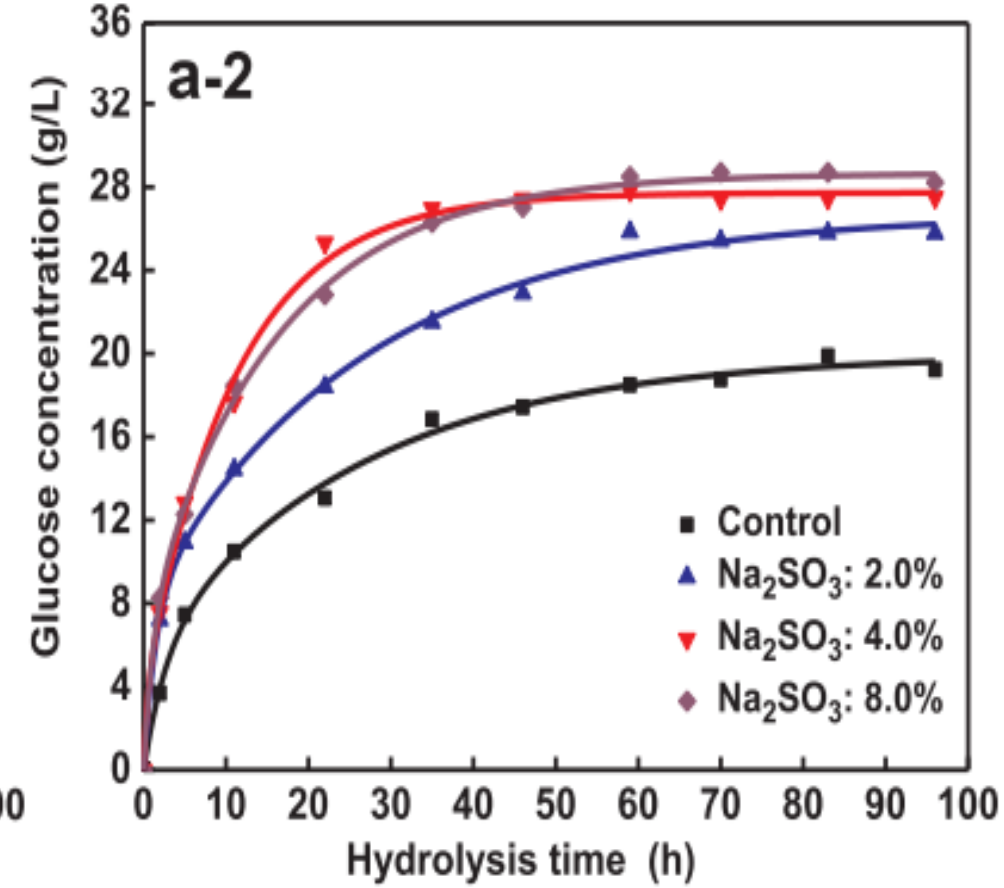
Results and discussion

预处理对玉米芯渣酶解的影响

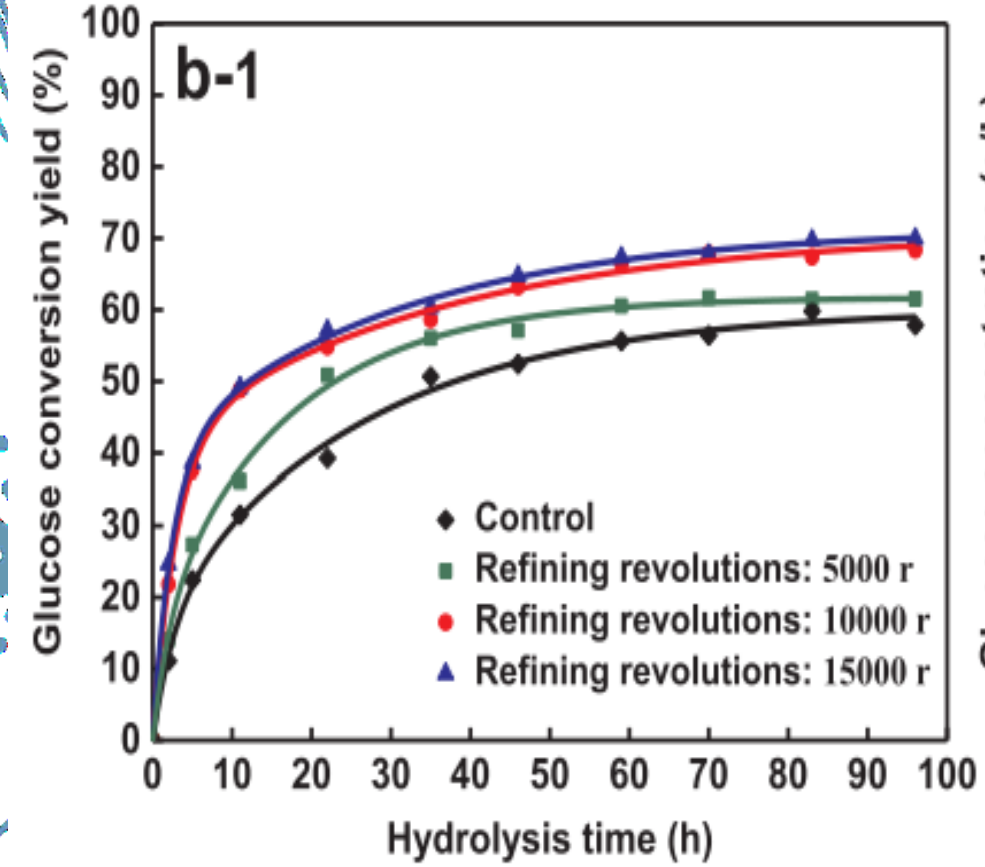
磺化法

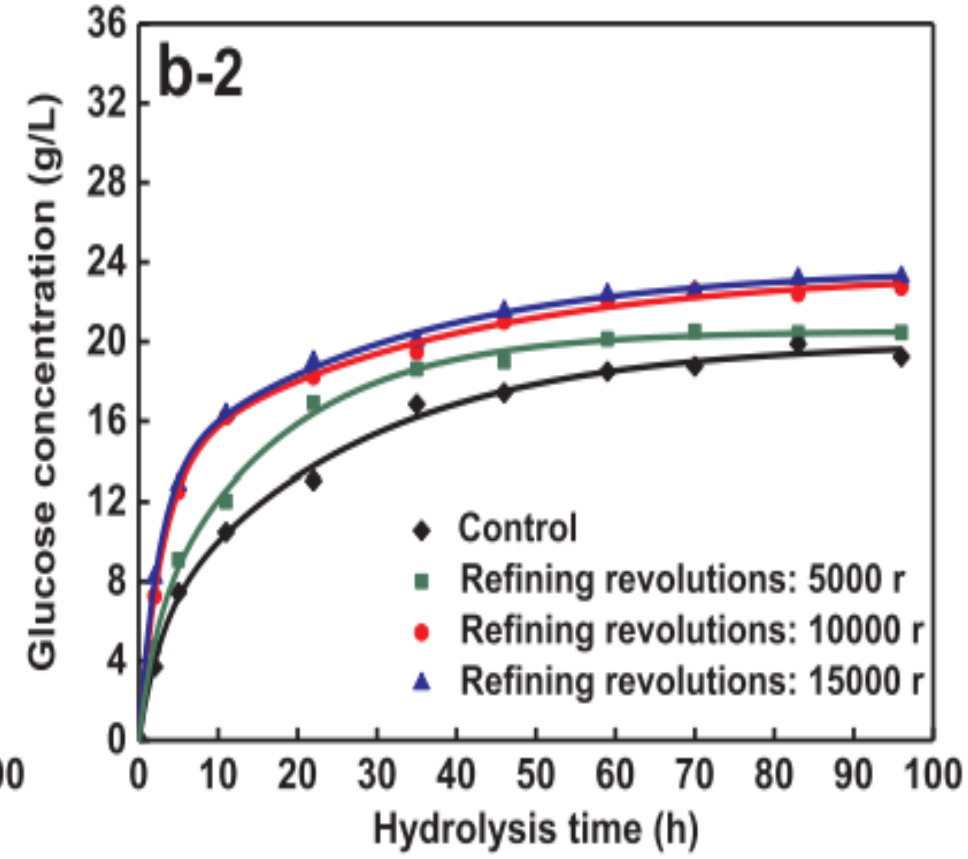




预处理对玉米芯渣酶解的影响

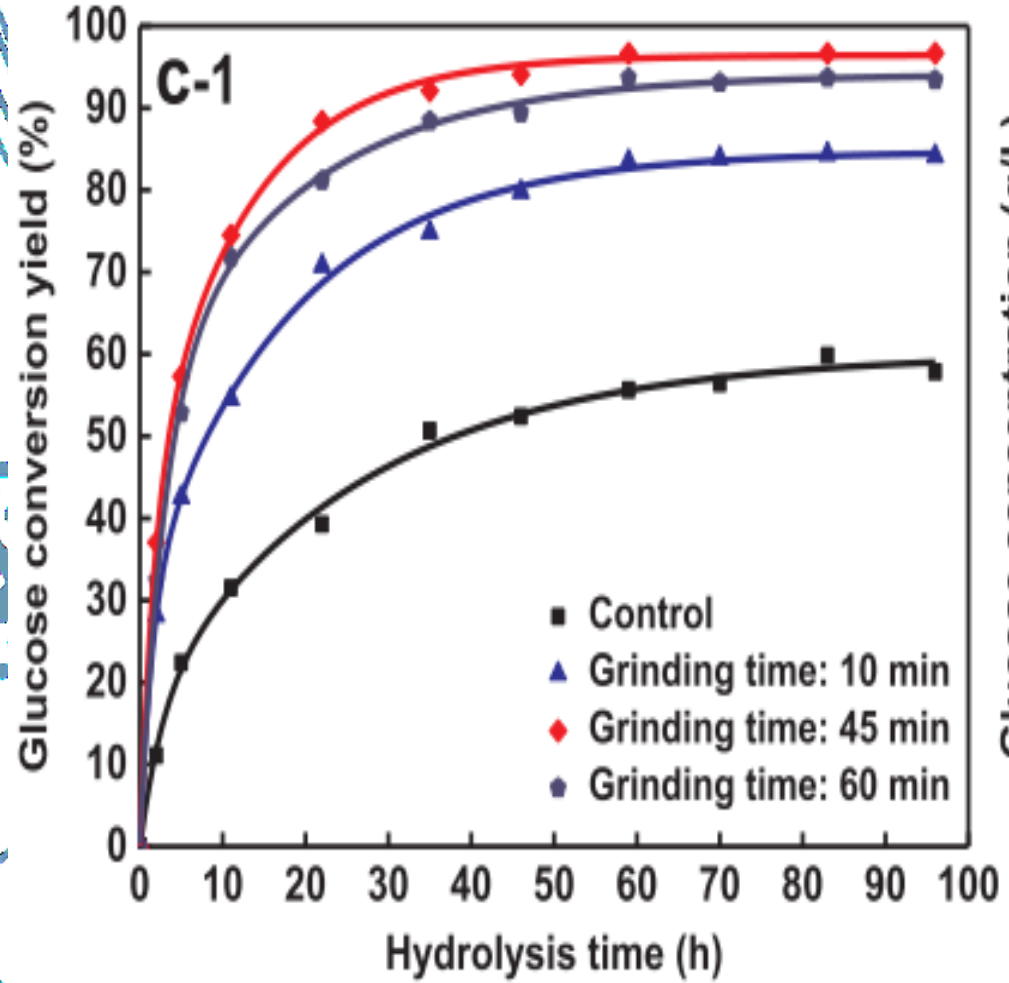
PFI机械精制法

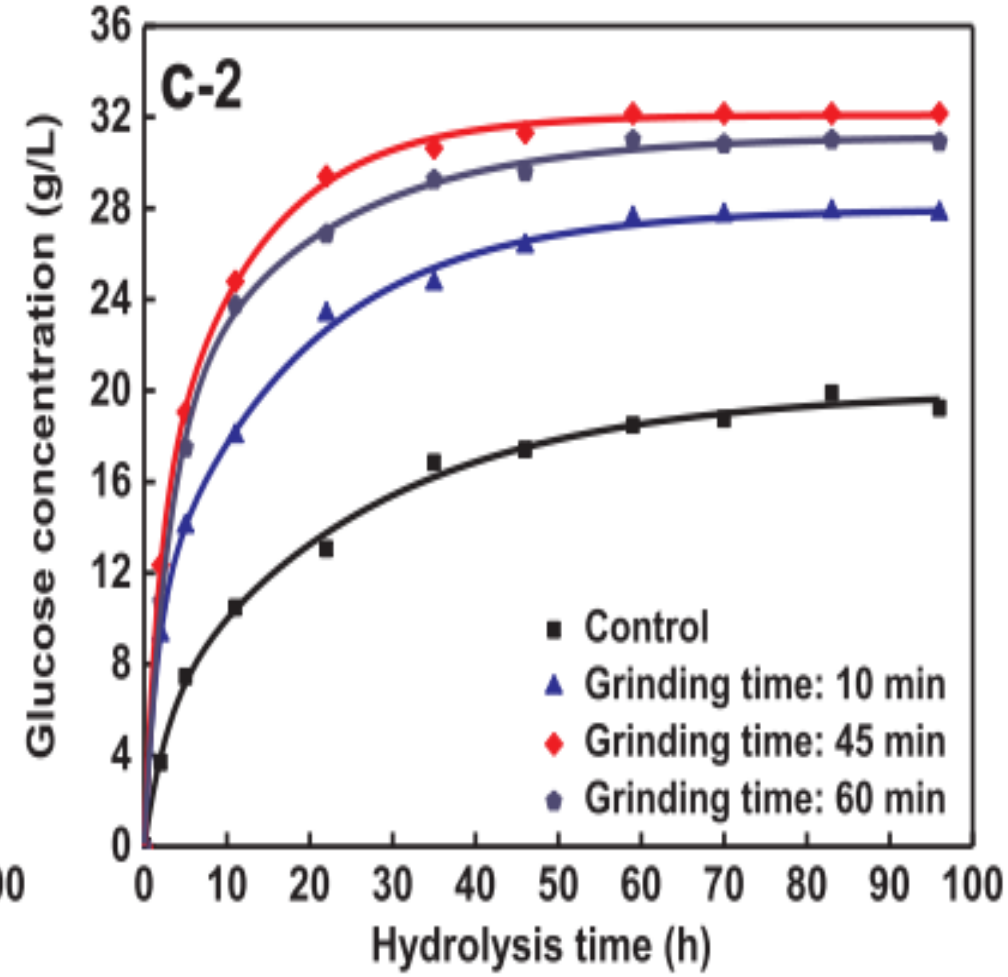




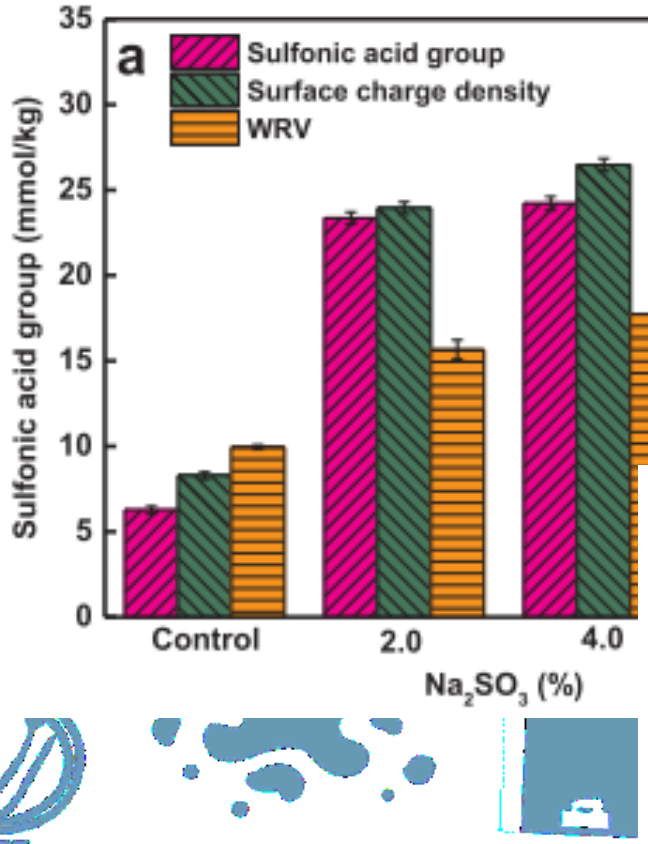
预处理对玉米芯渣酶解的影响

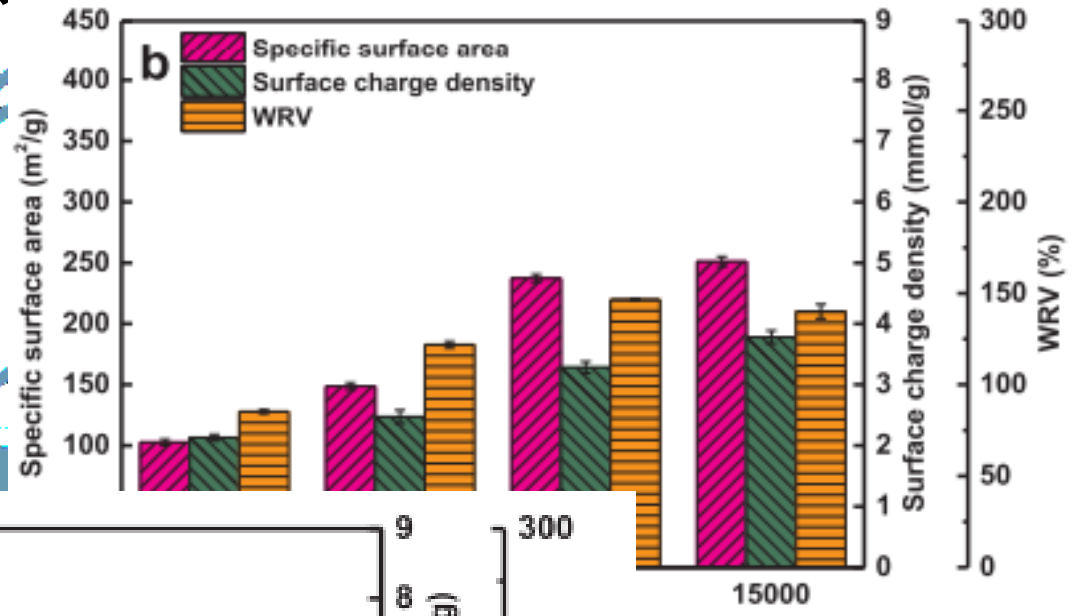
湿磨法

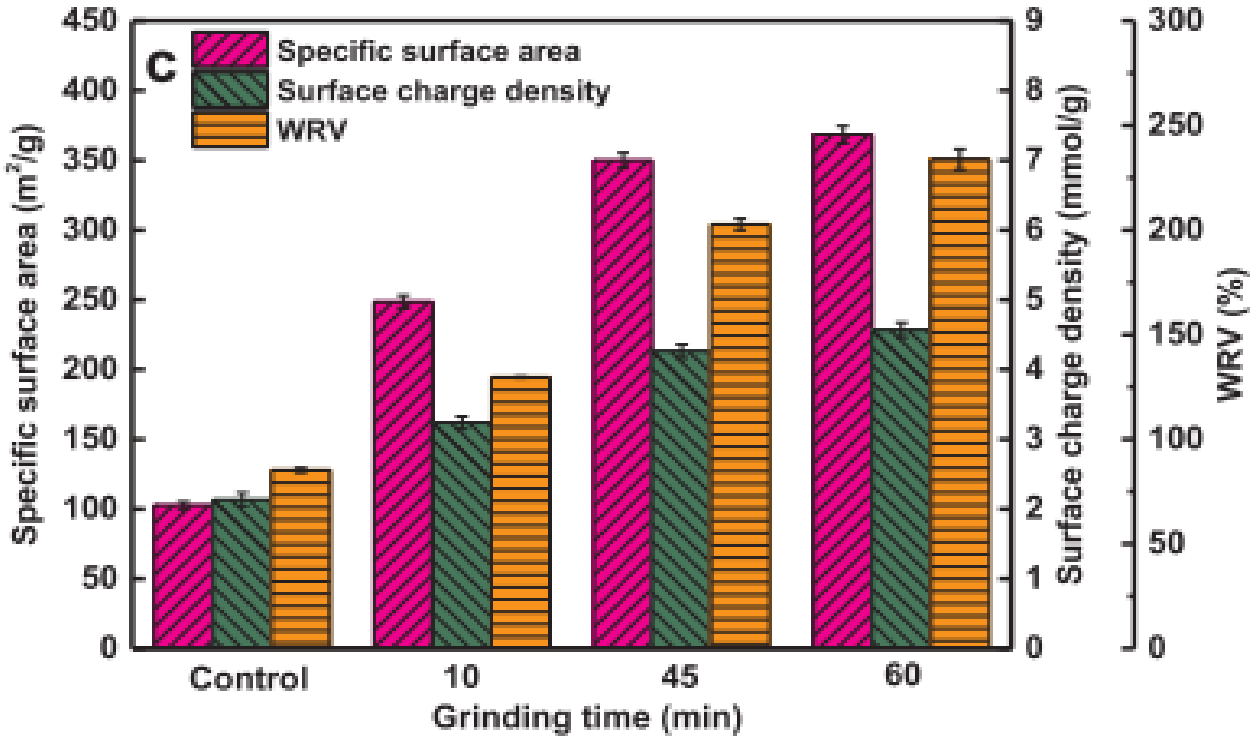




预处理对玉米芯渣基质特性的影响





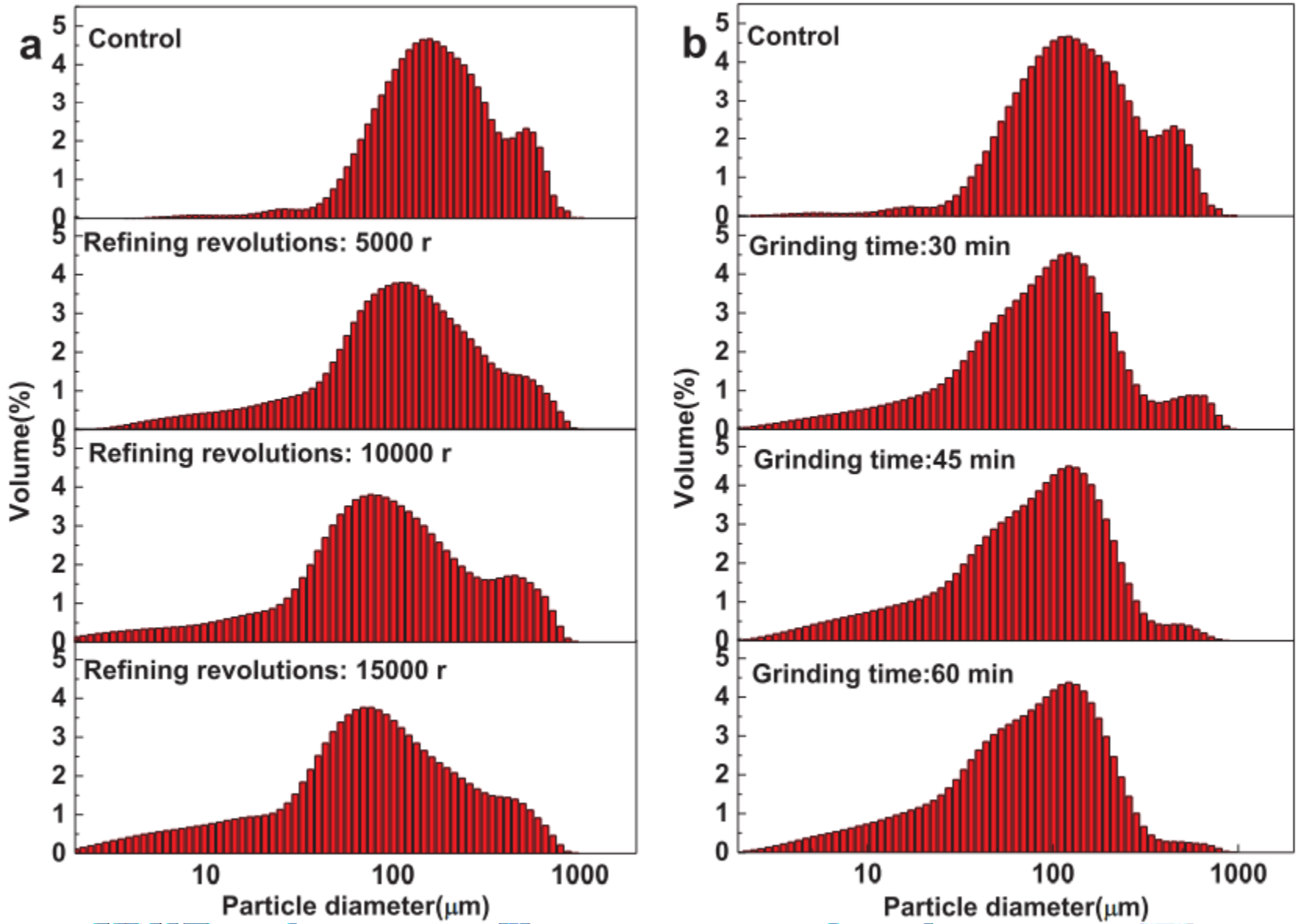


PFI精制法和湿磨法对玉米芯渣基质粒径的影响

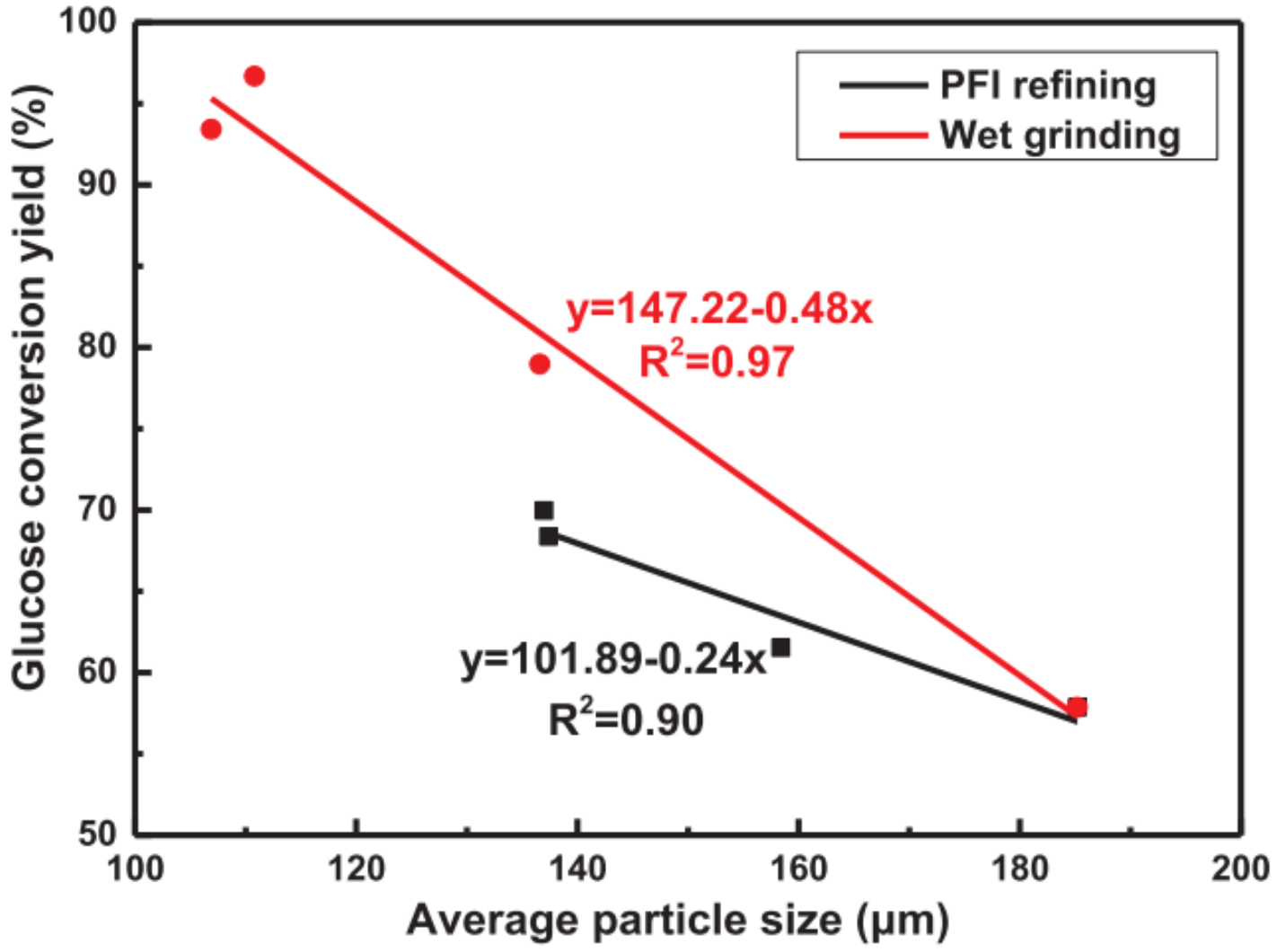
	Control	PFI refining revolutions (r)			Wet grinding time (min)		
		5,000	10,000	15,000	10	45	60
Average particle size (μm)	185.2	158.4	137.4	137	136.6	110.8	106.9
d_{10} (μm)	51.2	19.9	15.6	13.4	20.1	16.3	16.2
d_{90} (μm)	420	420.2	337.8	352	278.4	220.9	214

Note: d_{10} and d_{90} represent standard percentile readings at 10% and 90% of particles' diameters (Carrasco and Gao, 2019), respectively.

PFI精制（a）和湿磨（b）对玉米芯渣基质粒度分布的影响



机械处理玉米芯残渣基质平均粒径与葡萄糖转化率的关系



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Conclusions

Conclusions

本研究比较了三种预处理方法对玉米芯渣酶解及主要特性的影响。预处理后玉米芯渣的酶解明显增强，其中湿磨法的纤维素转化率和葡萄糖浓度最高。湿磨改变了酶解过程中的WRV、磺基含量、表面电荷密度等主要特性，有利于提高酶解效率。当湿磨时间为45min时，纤维素转化率可达96.7%，葡萄糖浓度可达32.2g/L。因此，合理利用这些资源，实现农业剩余物的可持续发展是十分必要的。

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