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超高压处理玉米醇溶蛋白的流变性和热特性分析

Rheological properties and calorimetric analysis on zein under high pressure treatment

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英文关键词:zein rheology high pressure effects differential scanning calorimetric

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中文摘要:

为了阐明超高压处理对玉米醇溶蛋白流变行为和热性能的影响及其作用规律，采用旋转黏度计测定了不同温度条件下超高压处理玉米醇溶蛋白溶液的流变特性参数，用幂定律拟合了剪切应力（τ）与剪切速率（γ）的关系曲线，建立了黏度（η）和温度（T）的数学模型；利用差示扫描量热仪（DSC）测定了超高压处理前后玉米醇溶的结晶温度（Tc）、熔融温度（Tm）、结晶焓（ΔHm），并利用扫描电子显微镜（SEM）对其进行了表征。结果表明，超高压处理后玉米醇溶蛋白溶液逐渐偏离牛顿体，具有假塑性流体特性。随着压力增大，黏度呈现先增加后减小再增加的趋势，当压力为400 MPa时，黏度达到最高；随着温度升高，黏度开始下降，当温度为40℃黏度降到最低；而随着剪切速率的增大，黏度随之下降，但当剪切速率接近100 s-1时，黏度变化不明显。超高压处理后玉米醇溶蛋白粉的熔融温度升高，结晶焓减小，热特性曲线变性峰（Tm-Tc）有变宽的趋势。SEM显示超高压处理后部分玉米醇溶蛋白颗粒凝聚成环状或者链状结构。

英文摘要:

To investigate the influence of high pressure treatment on the rheological behavior and thermal property of zein, the rotating viscometer and differential scanning calorimetric (were employed to obtain the property parameters, including shear stress (τ), shear rate (γ), viscosity (η), crystallization temperature (Tc), melting temperature (Tm), and crystallizationenthalpy (ΔHm). Then their relationship curve and mathematical model were fitted and established by rheological testing and calorimetric analyzing. The structures o zein solution under different high-pressure treatment were characterized by scanning electron microscopy (SEM). The results indicated that the zein solutions with high pressure treatment showed a pseudo plastic fluid characteristic. As the pressure increased, the viscosity of the solution first increased, and then decreased, and then increased once again. When the pressure was 400 MPa, the viscosity of the solution reached the highest value. When the shear temperature increased, the viscosity of the solution first decreased, and increased, and reached the lowest value at 40℃. With the shear rate increased, the viscosity of the solution reduced, and reached a plateau when the shear rate was close to 100 s Zein powders were treated under 400 MPa pressure, melting temperature(Tm) increased and crystallization enthalpy(ΔHm) decreased. The width of DSC melting peak(Tm-Tc) unde high pressure treatment broadened, proving the coordination of zein structure became lower. SEM showed that zein particles under 400 MPa pressure treatment condensed in a ri chain structure.

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