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Analysis of Intermolecular Interaction among Pectin Molecules in Aqueous Sugar Solutions

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Although the viscosity of aqueous solution of high methoxyl pectin is known to increase drastically when sugars coexist, the detailed mechanism for the increase in viscosity was not fully understood. Therefore, the viscosity of citrus and apple pectin solutions with various sugars compositions was measured with temperature varying from 5 to 40°C to analyze the intermolecular interactions among pectin molecules. For single-composition pectin solutions, the activation energy for viscosity, E_a , increased from 17.5 to 31.9 kJ/mol with an increase in pectin concentration up to 2% for the case of citrus pectin, reflecting the increase in pectin-pectin interaction. For pectin solutions with coexisting sugars, E_a increased more with increasing sugar concentration. When compared at the same water activity, the increase in E_a is also dependent on the type of sugar. Sugars with stronger solvent-ordering activity produced greater increases in E_a . These results suggest that sugars increase the pectin-pectin interaction both through their own hydration effect, which enhances the hydrogen bonding among pectin molecules, and through the solvent-ordering effect to enhance the hydrophobic interaction.

Keywords: [pectin](#), [viscosity](#), [activation energy](#), [hydrogen bonding](#), [hydrophobic interaction](#)

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