

HYDROCOLLOID PROPERTIES



25/09/2002

PROPERTY	HIGH METHOXYL PECTIN	LOW METHOXYL PECTIN	KAPPA CARRAGEENAN	IOTA CARRAGEENAN	LAMBDA CARRAGEENAN	AGAR-AGAR	ALGINATE	PROPYLENE GLYCOL ALGINATE	CELLULOSE GUM	LOCUST BEAN GUM	GUAR GUM	XANTHAN GUM	GELATINE	GUM ARABIC	
Solubility in Cold Water	Yes	Yes	Yes (Na <sup>+</sup> only)	Yes (Na <sup>+</sup> only)	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	
Solubility in Hot Water	Yes	Yes	Yes (> 80°C)	Yes (> 80°C)	Yes (> 80°C)	Yes (> 90°C)	Yes	Yes	Yes	Yes (> 85°C)	Yes	Yes	Yes (> 40°C)	Yes	
Solubility in Cold Milk	Yes	No	No	No	Thickens	No	Yes with sequestering agents	Yes	No	No	Yes	Yes	No	Yes	
Solubility in Hot Milk	Yes	Yes	Yes (> 80°C)	Yes (> 80°C)	Yes (> 80°C)	Yes (> 90°C)	Yes with sequestering agents	Yes	No	Yes (> 85°C)	Yes	Yes	Yes (> 40°C)	Yes	
Solubility in salt solutions	No	No	No	No	Yes	Yes (> 90°C)	No	No	Only if high DS	Yes (> 85°C)	Yes	Yes	Yes (> 40°C)	Yes	
Solubility in sugar solution	Soluble hot	Soluble hot	Soluble hot	No	Soluble hot	Yes (> 90°C)	Soluble hot	Yes	Yes	Yes (> 85°C)	Yes	Yes	Yes (> 40°C)	Soluble hot	
Solubility in 20%+ Ethanol	No	No	No	No	No	No	Yes (up to 40%) Low above pH = 5.5 High below pH = 5.5	Yes (up to 40%)	Yes (up to 30%)	No	No	Yes (up to 50%)	No	Yes (up to 60%)	
Solution Viscosity	Low	Low	Low	Medium	High	Low	High	High	High	High up to 85°C	High cold, low hot	High (< 100°C)	Low	Low	
Optimum pH range	2.5 - 4.0	2.5 - 5.5	4.0 - 10.0	4.0 - 10.0	4.0 - 10.0	2.5 - 10.0	2.8 - 10.0	2.8 - 10.0	3.0 - 10.0	4.0 - 10.0	4.0 - 10.0	1.0 - 13	4.5 - 10.0	2.0 - 10.0	
Optimum soluble solids range	55 - 80%	30 - 80%	0 - 40%	0 - 20%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	
Gelation conditions	pH < 4 and Soluble solids between 55-80%	Presence of Ca <sup>2+</sup> ions and below setting temperature	Presence of K <sup>+</sup> , Na <sup>+</sup> or Ca <sup>2+</sup> ions and below setting temperature	Presence of K <sup>+</sup> , Na <sup>+</sup> or Ca <sup>2+</sup> ions and below setting temperature	Non-gelling	If < 32 - 39°C	If pH below 4 or in presence of Ca <sup>2+</sup> ions Calcium gels strong, brittle	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Non-gelling	With LBG, Tara gum, Cassia gum	Below setting temperature Soft to strong cohesive, gummy	Non-gelling
Gel Texture	Cohesive, No syneresis	Cohesive to brittle.	Strong, brittle. Syneresis	Elastic, No syneresis	Non-gelling	Strong, brittle.	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Cohesive, gummy	Non-gelling	
Thermoreversible gel	Yes	Yes	Yes	Yes	Non-gelling	Yes	No (Irreversible)	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Yes	Yes	Non-gelling
Gel setting temperature	Increases with increasing DE, decreasing pH and increasing sugar	Increases with decreasing DE, increasing Ca <sup>2+</sup> and increasing sugar	Increases with increasing K <sup>+</sup> , Na <sup>+</sup> , Ca <sup>2+</sup> and sugar	Increases with increasing K <sup>+</sup> , Na <sup>+</sup> , Ca <sup>2+</sup> , sugar and LBG	Non-gelling	Constant	Non-existent	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Constant	Increases with increasing MW	Non-gelling	
Gel strength	Increases with increasing concentration and MW	Increases with increasing concentration and Ca <sup>2+</sup>	Increases with increasing concentration, K <sup>+</sup> Ca <sup>2+</sup> and LBG	Increases with increasing concentration, K <sup>+</sup> , Na <sup>+</sup> and Ca <sup>2+</sup>	Non-gelling	Increasing with increasing concentration, sugar and pH	Increases with increasing concentration, Ca <sup>2+</sup> and decreasing pH to 3.6	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Non-gelling	Increasing with concentration	Increases with concentration and less salt	Non-gelling
Effect on Milk at Neutral pH	Precipitation	Gelation	Ionic interaction. Increasing gel strength	Ionic interaction. Increasing gel strength	Ionic interaction. Increased viscosity	None	None. Insoluble	None	Precipitation	Separation	Separation	None	None	None	
Effect on Milk and other proteins at acid pH	Adsorption to casein particles below pH 4.2. Adsorption to soy protein particles below pH 4.8	None	Precipitation below iso-pH	Precipitation below iso-pH	Precipitation below iso-pH	None	None	None	None	Adsorption to casein particles below pH 4.6. Adsorption to soy protein particles below pH 5.0	None	None	Precipitation below Iso pH	None	
Incompatibility	Water soluble alcohols, ketones, heavy metals, quaternary detergents, cationic macromolecules	Water soluble alcohols, ketones	Water soluble alcohols, ketones, quaternary detergents, cationic macromolecules	Water soluble alcohols, ketones, quaternary detergents, cationic macromolecules	Water soluble alcohols, ketones, quaternary detergents, cationic macromolecules	Water soluble alcohols, ketones	Water soluble alcohols, ketones, milk, gum arabic	Water soluble alcohols, ketones	Water soluble alcohols, ketones, quaternary detergents, cationic macromolecules	Water soluble alcohols, ketones	Water soluble alcohols, ketones	Water soluble alcohols, ketones, gum arabic below pH 5	Water soluble alcohols, ketones, anionic macromolecules below iso-pH, gum arabic below iso-pH	Water soluble alcohols, ketones, alginate, gelatine, xanthan gum	