

# HYDROCOLLOID PROPERTIES

PROPERTY	LOCUST BEAN GUM	GUAR GUM	TARA GUM	HIGH METHOXYL PECTIN	LOW METHOXYL PECTIN	XANTHAN GUM	KAPPA CARRAGEENAN	IOTA CARRAGEENAN	LAMBDA CARRAGEENAN	AGAR-AGAR	ALGINATE	PROPYLENE GLYCOL ALGINATE	CELLULOSE GUM	GELATINE	GUM ARABIC
<b>Solubility in Cold Water</b>	No	Yes	Yes	Yes	Yes	Yes	Yes (Na <sup>+</sup> only)	Yes (Na <sup>+</sup> only)	Yes	No	Yes	Yes	Yes	No	Yes
<b>Solubility in Hot Water</b>	Yes (> 80°C)	Yes	Yes	Yes	Yes	Yes	Yes (> 80°C)	Yes (> 80°C)	Yes (> 80°C)	Yes (> 90°C)	Yes	Yes	Yes	Yes (> 40°C)	Yes
<b>Solubility in Cold Milk</b>	No	Yes	Yes	Yes	No	Yes	No	No	Thickens	No	Yes with sequestering agents	Yes	No	No	Yes
<b>Solubility in Hot Milk</b>	Yes (> 80°C)	Yes	Yes	Yes	Yes	Yes	Yes (> 80°C)	Yes (> 80°C)	Yes (> 80°C)	Yes (> 90°C)	Yes with sequestering agents	Yes	No	Yes (> 40°C)	Yes
<b>Solubility in salt solutions</b>	Yes (> 80°C)	Yes	Yes	No	No	Yes	No	No	Yes	Yes (> 90°C)	No	No	Only if high DS	Yes (> 40°C)	Yes
<b>Solubility in sugar solution</b>	max 50%	max 30%	max 50%	Soluble hot	Soluble hot	Yes	Soluble hot	No	Soluble hot	Yes (> 90°C)	Soluble hot	Yes	Yes	Yes (> 40°C)	Soluble hot
<b>Solubility in 20%+ Ethanol</b>	No	No	No	No	No	Yes (up to 50%)	No	No	No	No	Yes (up to 40%)	Yes (up to 40%)	Yes (up to 30%)	No	Yes (up to 60%)
<b>Solution Viscosity</b>	High up to 85°C	High cold, low hot	high cold, low hot	Low	Low	High(< 100°C)	Low	Medium	High	Low	Low above pH = 5.5 High below pH = 5.5	High	High	Low	Low
<b>Optimum pH range</b>	4.0 - 10.0	4.0 - 10.0	4.0 - 10.0	2.5 - 4.0	2.5 - 4.5	1.0 - 13	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	4.5 - 10.0	2.0 - 10.0
<b>Optimum soluble solids range</b>	0 - 50%	0 - 30%	0 - 50%	55 - 80%	30 - 80%	0 - 80%	0 - 40%	0 - 20%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%	0 - 80%
<b>Gelation conditions</b>	Non-gelling	Non-gelling	Non-gelling	pH < 3.5 and Soluble solids between 55-80%	Presence of Ca <sup>2+</sup> ions and below setting temperature	With LBG, Tara gum, Cassia gum	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	Non-gelling	Non-gelling	Below setting temperature	Non-gelling
<b>Gel Texture</b>	Non-gelling	Non-gelling	Non-gelling	Cohesive, No syneresis	Cohesive to brittle.	Cohesive, gummy	Strong, brittle. Syneresis	Elastic, No syneresis	Non-gelling	Strong, brittle.	Calcium gels strong, brittle	Non-gelling	Non-gelling	Soft to strong cohesive, gummy	Non-gelling
<b>Thermo-reversible gel</b>	Non-gelling	Non-gelling	Non-gelling	No	Yes	Yes	Yes	Yes	Non-gelling	Yes	No (Irreversible)	Non-gelling	Non-gelling	Yes	Non-gelling
<b>Gel setting temperature</b>	Non-gelling	Non-gelling	Non-gelling	Increases with increasing DE, decreasing pH and increasing sugar	Increases with decreasing DE, increasing Ca <sup>2+</sup> and increasing sugar	Constant	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	Increases with increasing MW	Non-gelling
<b>Gel strength</b>	Non-gelling	Non-gelling	Non-gelling	Increases with increasing concentration and MW	Increases with increasing concentration and Ca <sup>2+</sup>	Increasing with concentration	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	Increases with concentration and less salt	Non-gelling
<b>Effect on Milk at Neutral pH</b>	Separation	Separation	Separation	Precipitation	Gelation	None	Ionic interaction. Increasing gel strength	Ionic interaction. Increasing gel strength	Ionic interaction. Increased viscosity	None	None. Insoluble	None	Precipitation	None	None
<b>Effect on Milk and other proteins at acid pH</b>	None	None	None	Adsorption to casein particles below pH 4.4. Adsorption to soy protein particles below pH 4.8	None	Precipitation below iso-pH	Precipitation below iso-pH	Precipitation below iso-pH	Precipitation below iso-pH	None	None	None	Adsorption to casein particles below pH 4.6. Adsorption to soy protein particles below pH 5.0	None	None
<b>Incompatibility</b>	Water soluble alcohols, ketones	Water soluble alcohols, ketones	Water soluble alcohols, ketones	Water soluble alcohols, ketones, heavy metals, quaternary detergents, cationic macromolecules	Water soluble alcohols, ketones	Water soluble alcohols, ketones, gum arabic below pH 5	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, anionic macromolecules below iso-pH, gum arabic below iso-pH	Water soluble alcohols, ketones, gelatine, xanthan gum