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Guar gum: A versatile industrial plant polymer

Dear Reader,

Guar gum is a non-ionic carbohydrate polymer derived from the endosperm of two annual leguminous plants *Cyanaposis teragonalobus* and *Cyanaposis psoraloides*. Chemically, it is galactomannan consisting straight chain of mannose units attached by *β*-D-(1→4) linkages, having *α*-D-galactopyranosyl unit bonded to poly(mannose) chain through (1→6) glycosidic links. Molecular weight of galactomannan varies ranging from 50 to 8000 kDa depending on the seeds and origin of plants; however polymer usually contains a definite ratio of building blocks, i.e., 1: 2 ratio of galactose to mannose. It is used in wide range of industries including cosmetics, paper, pharmacy, textile, adhesive, inks, lithography, paints, explosive and smoking products. In general, seed gums are non-toxic and applicable as emulsion stabilizer, thickening and gelling agents. Although, they nearly indigestible but consum in many food and pharmaceutical products as valuable additives to improve product qualities.

Appendix: Top 10 world ranking of researchers working on guar gum R&D*

Sl. No.	Name of Researcher	Current Affiliation	World Ranking
1.	**Ashutosh Tiwari**	Linköpings universitet, Sweden	1
2.	**Vandana Singh**	University of Allahabad, India	1
3.	**Y. S. R. Krishnaiah**	Kuwait University, Kuwait	2
4.	**Servet Gulum Sumnu**	Middle E. Tech. University, Turkey	2
5.	**Wang Aiqing**	Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China	2
6.	**Hiroshi Hara**	Hokkaido University, Japan	3
7.	**Li-Ming Zhang**	Sun Yat Sen Zhongshan University, China	3
8.	**Charles S. Brennan**	Massey University, New Zealand	4
9.	**S. B. Ross-Murphy**	King's College London, UK	4
10.	**Joanne L. Slavin**	University of Minnesota, USA	5
11.	**Byoungseung Yoo**	Dongguk University Seoul, South Korea	5
12.	**C. A. Bailey**	Texas A&M University, USA	6
13.	**Cristina M. Rosell**	Institute of Agrochemistry and Food Technology, Spain	7
14.	**R. P. Singh**	Indian Institute of Science Education and Research-Pune, India	8
15.	**Cristina Ferrero**	Universidad Nacional de La Plata, Argentina	9
16.	**F. Chenlo**	Universidad de Santiago de Compostela, Spain	10

*All statistical data have been analyzed by editorial team of Advanced Materials Letters from last ten year's guar gum scientific archives (June 2002 - June 2012).

The plant polysaccharides including guar gum are reported to ripen eco- properties even after grafting with synthetic polymers retaining the desirable characters for engineering of high performance applied industrial materials. Modification of guar gum by grafting with water-soluble vinyl and vinylidene monomers results cutting-edge bio-based materials with hybrid properties. Typically, hydrophilic and hydrophobic grafted guar gums are used in the preparation of flocculants and drag reducing agents to treat domestic and industrial water effluent. Cross-linked guar-grafted-polyacrylamide based anionic micro gels, amphiphilic guar gum grafted with poly(*ε*-caprolactone) and photopolymerizable guar gum-methacrylate macromonomers have reported to use as a macro and nano carrier for *in vitro* controlled drug delivery and tissue engineering applications, respectively. The conducting polymer grafted guar gum has displayed pH and temperature dependent electrical conductivity, recommended as bioelectronics materials for sensor applications. A fertile field of research is promised to graft linear or branched polymers onto guar gum for example monomers of conducting polymers and functional monomers such as vinyl acetate, acrylonitrile, acrylamide, methylmethacrylate, acrylic acid, methacrylonitrile, 2-dimethyl aminoethyl methacrylate, etc. with or without redox couples at range of processing conditions yielding adaptable eco-friendly materials for pragmatic industrial and biomedical purposes.

With best regards

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