

Search query (3): [SP]: cross-reference to related applications[0001] the present application claims priority to u.s. provisional patent application no. 62/063,476, filed oct. 14, 2014.field of the invention[0002] the invention is related generally to the use of simulated moving bed chromatography to separate and enrich sugar or other components in a mixture with limited dilution, and more particularly to methods for preparing an enriched high fructose corn syrup (hfcs) containing a higher concentration of fructose than obtained from the action of glucose isomerase at equilibrium without need to blend the lower percent equilibrium syrup with a higher percent percent fructose enriched syrup.description of related art[0003] high fructose corn syrup (hfcs) is a well-known sweetener obtained from corn starch that has certain defined proportions of fructose and glucose. hfcs is conventionally obtained by (a) liquefaction and hydrolysis of corn starch with heat, alpha amylase and glucoamylase to form an aqueous glucose syrup known as corn syrup, having approximately 95 percent glucose, and (b) isomerization of a portion of the glucose in the corn syrup using a column-bound glucose isomerase, at 60 degrees centigrade, until the material approaches the equilibrium point of the isomerase, which generally produces a syrup mixture that is about 42 percent -44 percent fructose and about 56 percent -58 percent glucose (referred to herein as 42 percent fructose syrup or more simply 42 syrup).[0004] many food and beverage manufacturers desire a hfcs product where the fructose proportion is greater than the glucose proportion to more closely mimic the taste profile of sucrose. the most typically desired hfcs product is a 55 percent fructose syrup, however, some consumers desire hfcs products containing as much as 90 percent fructose. to achieve these higher fructose proportions the 42 percent fructose syrup obtained from the isomerase column is subjected to chromatographic separation over a divalent cation resin that preferentially retards and therefore enriches the fructose relative to the glucose in an enrichment zone of the column. typically the cation is calcium on a sulfonic acid resin. the chromatographic resin is eluted with water as the mobile phase to obtain a hfcs product that is about 90 percent fructose (90 percent fructose syrup). this 90 percent fructose product is then blended with the 42 percent fructose syrup from the isomerase column to achieve hfcs products with fructose proportions greater than 50 percent, and less than 90 percent, most preferably about 55 percent.[0005] typically the chromatographic enrichment process uses a simulated moving bed (smb) chromatography apparatus. smb chromatography operates by dividing a column bed into multiple discrete inter-connected column segments, introducing the input feed and eluent feed in a common flow direction over the linked column segments while essentially moving the column segments in a direction opposite the flow direction of the input and eluent streams. in some designs this is accomplished directly by actually rotating the column segments in a circular carousel in a direction opposite to the flow of the input and eluent streams. in other designs, the column segments are stationary but the ports for input and output of the column segments are rotated in the same direction as the flow of input and eluent streams. in either design, the rotation is herein referred to as a step or a step movement. in either case the effect is the same, the material that preferentially retards with the stationary phase in the column segments (e.g., fructose in hfcs production) is preferentially carried with the column segments opposite in direction to the flow of material that preferentially flows with the moving phase eluent (e.g., glucose with water in hfcs production) across the whole length of the interconnected column segments. the material that preferentially retards with the stationary phase is collected as an extract product and the material that preferentially flows with the moving phase eluent is collected in a raffinate stream.[0006] when input and eluent stream flow rates are properly coordinated with column segment movements, the result is a continuous standing wave of zones of feedstock input, zones of enrichment, zones of elution, and zones of recover (optional). in the case of hfcs production, syrup containing about 90 percent fructose/10 percent glucose is collected as the extract product and a syrup containing about 10 percent fructose/90 percent glucose is collected in the raffinate stream. a conventional hfcs production process using an smb apparatus with a 42 percent fructose/58 percent glucose feed, a water eluent feed, a fructose-enriched extract product and a glucose-enriched raffinate stream is depicted in fig. 1.[0007] two drawbacks of the conventional method of making hfcs are that first, it requires an additional input of water as the eluent, which increases cost. second, the chromatographic enrichment of fructose using water as the eluent results in dilution of the total sugar concentration in the extract product and the raffinate stream. typically the input stream of 42-44 percent fructose has a dissolved solids content of 45 percent to 60 percent, the 90 percent fructose syrup in the extract product has a dissolved solids content of 10 percent to 30 percent, and the glucose-enriched raffinate stream has a dissolved solids content of about 5-30 percent. in order to produce a product having a commercially desirable dissolved solids concentration of at least 50 percent ds and typically about 70 percent ds, the 90 percent fructose extract product is typically evaporated to a desired concentration that is at least the same as the 42 percent fructose input feed before blending to make a product such as 55 percent hfcs as illustrated in fig. 1. the need for evaporation increases cost of operation.brief summary of the invention[0008] one exemplary embodiment of the present invention is directed to a method of adjusting the composition of a chromatography product to achieve a target proportion of a desired component by contacting an input zone of a simulated moving bed ("smb") chromatography apparatus comprising a cation resin with an input feed comprising input feed proportions of the desired component and a second component and having an input feed dissolved solids content, and contacting an elution zone of the smb apparatus with an eluent feed comprising eluent feed proportions of the desired component and the second component and having an eluent feed dissolved solids content.[0009] in certain exemplary embodiments, the smb apparatus is operated to blend the desired component from the input feed, delivered through an enrichment zone of the smb apparatus, with the desired component from the eluent feed, delivered through the elution zone, to form an extract product comprising the target proportion of the desired component and an extract dissolved solids content, wherein the target proportion of the desired component is greater than the input feed proportion of the desired component, and wherein the extract dissolved solids content is at least 50 percent of the input feed dissolved solids content. in more desirable embodiments the dissolved solids content of the extract is at least 60 percent of the input feed dissolved content, and in the most desired embodiments the dissolved solids content of the extract is at least 80 percent of the input feed dissolved content. the extract product having the target proportion of the desired component is collected from the smb apparatus.[0010] in certain exemplary embodiments of the invention, the eluent feed proportion of the desired component is selected to blend with the desired component from the input feed delivered through the enrichment zone to result in the target proportion of the desired component in the extract product.[0011] in some exemplary embodiments, the eluent feed is the same as the input feed or the eluent feed is diluted no more than 0.2 volumes of water prior to contacting the elution zone.[0012] in certain embodiments, the eluent feed is continuously combined with water to contact the elution zone with a diluted eluent feed, wherein a volume ratio of eluent feed to water is 1:2. [0013] in certain exemplary embodiments, the eluent feed is contacting the elution zone for a period of time, followed by a second period of time where water is contacting the elution zone without the eluent feed, wherein the first period of time and the second period of time are selected so that a volume ratio of eluent feed to water is 1:2 prior to a step movement in the smb apparatus.[0014] in certain exemplary embodiments, the method of the present invention further comprises collecting from the smb apparatus a raffinate stream having raffinate proportions of the desired component and the second component, wherein the raffinate proportion of the second component is higher than the input feed proportion of the second component.[0015] in some exemplary embodiments, the method of the present invention can be used wherein the desired component is fructose and the second component is glucose.[0016] in certain embodiments, the raffinate stream comprises glucose and is added to an input stream comprising glucose to form a combined glucose-enriched stream. a glucose isomerase chromatography column comprising glucose isomerase is contacted with the raffinate stream and/or combined glucose-enriched stream for a time sufficient to enrich a fructose proportion in the column. the fructose-enriched mixture is eluted from the glucose isomerase column. the eluted fructose-enriched mixture can be used in the input feed that contacts the input zone of the smb appar

Results: 9

1) Family number: 15898014 (US6258176B)

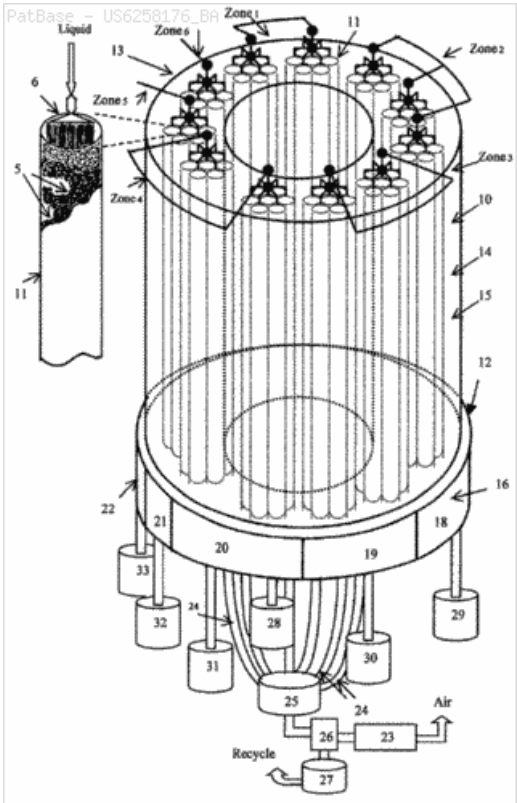
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Title:	Process for continuous separation of glucose and fructose			
Priority:	US19990274708 19990323	US20000595235 20000616	US20010756255 20010108	
Family:	Publication number	Publication date	Application number	Application date
	US6258176 BA	20010710	US20000595235	20000616
	US6299694 BA	20011009	US20010756255	20010108
Probable Assignee:	MA HSIEN CHIH			
Assignee(s):	MA HSIEN CHIH			
Inventor(s):(std):	MA HSIEN CHIH			
International class (IPC 8-9):	C13B20/14 (Advanced/Invention)			
International class (IPC 1-7):	C13D13/14 C13D3/12 C13D3/14			
CPC:	C13B20/144			
European class:	C13B20/14D			
US class:	127/46.1 127/46.2			

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Abstract:

The process implements a new mass transfer method by eliminating the displacement zone and fully utilizing the void volume in chromatography for proceeding prompt and efficient mass transfer proceeding between two phases. Said new method further integrates with a differential set-up protocols between solid phase resin and a multiplicity of liquid mixtures, an operation protocol, and an apparatus to implement all above indicated methods. By the virtue of said new mass transfer method and differential set-up, the process herein disclosed is capable of continuous separation of glucose and fructose feed solution into 100 percent yield of respective pure component. Said process is operated by simultaneously proceeding of feeding, fraction recovery, and enhancing concentration of separated fractions through a single stage recycle procedures. It cutbacks nearly 50 percent of resin stock compared under same feed throughput with SMB process that has separation of 88 percent recovery of 90 percent fructose purity in product stream.



2) Family number: 31933055 (US6896812B) © PatBase

Title:	PROCESS TO COMPENSATE FOR A DISCRETE NON-SEPARATING SECTION IN SIMULATED MOVING BED ADSORPTIVE SEPARATION PROCESSES			
Priority:	US20030621622 20030717			
Family:	Publication number	Publication date	Application number	Application date
	US6896812 BA	20050524	US20030621622	20030717
Probable Assignee:	UOP LLC			
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Inventor(s):(std):	FREY STANLEY J			
Agent(s):	TOLOMEI JOHN G; PASCHAL JAMES C; PIASECKI DAVID J; JAMES C; JOHN G; DAVID J			
International class (IPC 8-9):	B01D15/08 B01D15/18 (Advanced/Invention); B01D15/08 B01D15/10 (Core/Invention)			
International class (IPC 1-7):	B01D15/08			
CPC:	B01D15/1828 B01D2215/024			
European class:	B01D15/18R2A L01D215/02F2			
US class:	210/198.2 210/659			
Classification Explorer				
Cited documents:	US6375839 BA, US6063285 A, US5902486 A, US5667693 A, US5582736 A, US5578216 A, US5578215 A, US5102553 A, US4990259 A,			
Forward Citations:	WO09101282, US9950972, US9302955, US8821732, US8807164, US8722955, US7790040, US7544293, US7192526, US2011166406, US2011118525, US2008053543, US2007119783, US2006006113, TW1490024, KR101555393, KR101493550, JP5808914, JP2011506091, FR2925350, EP3206771,			

Abstract:

Fluctuations, such as perturbations in the quality of the extract and/or raffinate streams removed from the circuit in a simulated moving bed (SMB) adsorptive process having at least one discrete non-separating section are eliminated or significantly reduced. This is accomplished by increasing the fluid flow rate in a portion of the circuit in response to the location of a discrete non-separating section and changing the flow rate of at least one stream that is in fluid communication with the circuit consistent with the increased flow rate in the portion of the circuit. Multiple adjustments to the flow rates of the input and/or output streams and multiple increases in the fluid flow rates in portions of the circuit may be used simultaneously when for example there is more than one discrete non-separating section.

3) Family number: 62177242 (US2017304745A)

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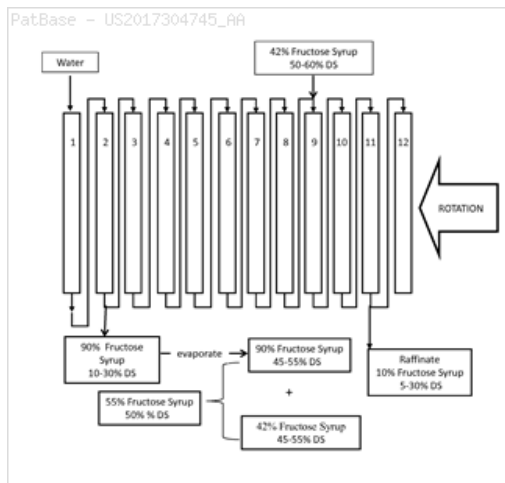
Title: METHOD FOR ADJUSTING THE COMPOSITION OF CHROMATOGRAPHY PRODUCTS
Priority: US20140063476P 20141014 US20150518278 20151013 WO2015US55224 20151013

Family:	Publication number	Publication date	Application number	Application date
	BR112017007743 A2	20180130	BR20171107743	20151013
	CL2017000905 A1	20171215	CL20170000905	20170412
	CO20170004650 A2	20170728	CO20170004650	20170508
	EP3206771 A1	20170823	EP20150851346	20151013
	EP3206771 A4	20180606	EP20150851346	20151013
	JP2017533817 T2	20171116	JP20170519661T	20151013
	KR20170067851 A	20170616	KR20177012599	20151013
	MX2017004966 A1	20170821	MX20170004966	20151013
	PE08312017 A1	20170704	PE20170000716	20151013
	PH2017500691 A	20171009	PH20170500691	20170411
	US2017304745 AA	20171026	US20150518278	20151013
	WO16061037 A1	20160421	WO2015US55224	20151013

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Agent(s): ESTUDIO CAREY LTDA; MAURICIO JARAMILLO CAMPUZANO; DOMPATENT VON KREISLER SELTING WERNER PARTNERSCHAFT VON PATENT U RECHTSANWALTEN MBB; INABA YOSHIYUKI; CRAFTON COREY M
Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW
International class (IPC 8-9): B01D15/00 B01D15/12 B01D15/16 B01D15/18 B01D15/36 B01D15/38 C12P19/02 C13K1/08 C13K11/00 C13K3/00 G01N30/46 G01N30/88 (Advanced/Invention)
CPC: B01D15/1828 B01D15/362 C13K1/08 C13K3/00 C13K11/00
[Classification Explorer](#)
Cited documents: WO05010216 A2, US7931751 BB, US6896812 BA, US6602420 BB, US6479700 BB, US6299694 BA, US6224776 BA, US4412866 A, US4373025 A,

Abstract:

Described herein is a method of adjusting the composition of a chromatography product to achieve a target enriched proportion of a desired component from an input feed having a lower proportion of the desired component using simulated moving bed ("SMB") chromatography wherein the eluent for the SMB apparatus may comprise the very input feed being enriched. The method is exemplified by enriching a high fructose corn syrup from a 42 percent fructose syrup to a 55 percent fructose syrup without substantially reducing the dissolved solids concentration of the 55 percent syrup relative to the input 42 percent syrup. The 42 percent syrup is also used as the eluent for the SMB apparatus and may be reconstituted from the raffinate stream by passing the raffinate stream over a glucose isomerase column alone or in combination with a dextrose feed. The method reduces water usage and saves energy by minimizing the need for evaporation to obtain a 55 percent fructose syrup with a high dissolved solids content.

**4) Family number: 28374570** (US2001009236A)

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Title: Method for fractionating a solution
Priority: FI19960002204 19960524 WO1997FI00306 19970521 US19970861613 19970522
US19990248089 19990210 KR20000030097 20000601 US20010794651 20010227
US20030386251 20030311

Family:	Publication number	Publication date	Application number	Application date
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	CA2256354 C	20060725	CA19972256354	19970521
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ZA9704203 A	19971222	ZA19970004203	19970515

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Agent(s): BERESKIN AND PARR LLP; REINHOLD COHN AND PARTNERS; SCULLY SCOTT MURPHY AND PRESSER

Designated states: AL AM AT AU AZ BA BB BE BF BG BJ BR BY CA CF CG CH CI CM CN CU CZ DE DK EE ES FI FR GA GB GE GH GR HU IE IL IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MC MD MG MK MN MR MW MX NE NL NO NZ PL PT RO RU SD SE SG SI SK SN SZ TG TJ TM TR TT UA UG US UZ VN YU

International class (IPC 8-9): B01D15/00 B01D15/08 B01D15/18 C13K3/00 H01L21/027 (Advanced/Invention); B01D15/00 B01D15/08 B01D15/10 C13K3/00 H01L21/027 (Advanced/Non-invention); B01D15/00 B01D15/08 B01D15/10 C13K3/00 H01L21/02 (Core/Invention)

International class (IPC 1-7): B01D B01D15/00 B01D15/08 C13K3/00 H01L21/027

CPC: H01L21/027 B01D2215/023 B01D15/361 B01D15/1828 G03F1/26

European class: B01D15/18R2A B01D15/36B L01D15/36B L01D215/02F

US class: 127/46.2 210/198.2 210/656 210/657 210/657S 210/659 210/660 210/660S

[Classification Explorer](#)

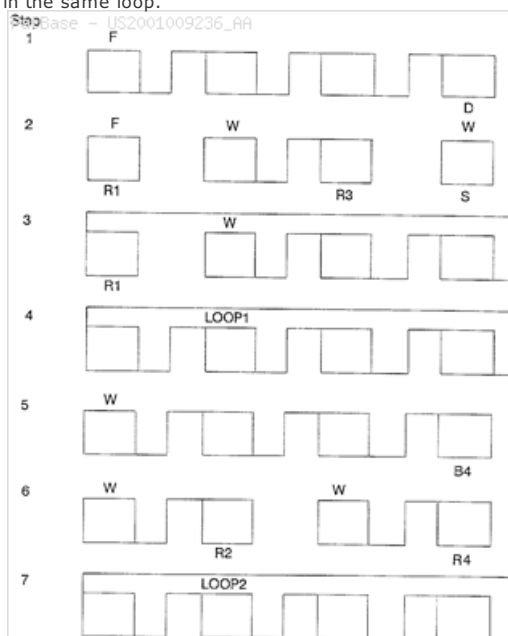
Cited documents: ZA974203, ZA97/4203, WOUS05572, WOUS00015, WOFI00162, WO9832514, WO9832514, WO9830724, WO9830724, WO9417213, WO9417213, WO9108815, WO9108815, WO9008193, WO9006769, WO8805467, WO8204265, WO8204265, WO8102420, WO8102420, WO8100014, WO8100014, US6572775 BB, US6482268 BB, US6224776 BA, US6214125 BA, US6187204 BA, US6187204, US6093326 A, US6093326, US6022394 A, US5980640 A, US5951777 A, US5932016 A, US5858424 A, US5851405 A, US5795398 A, US5795398, US5773052 A, US5773052, US5770061 A, US5770061, US5730877 A, US5730877, US5637225 A, US5637225, US5494525 A, US5494525, US5482631 A, US5482631, US5387347 A, US5387347, US5384035 A, US5384035, US5382294 A, US5382294, US5225580 A, US5198120 A, US5198120, US5177008 A, US5177008, US5156736 A, US5127957 A, US5127957, US5124133 A, US5124133, US5122275 A, US5122275, US5102553 A, US5102553, US5084104 A, US5084104, US5081026 A, US5081026, US5043171 A, US5043171, US5032156 A, US5032156, US4990259 A, US4990259, US4980277 A, US4980277, US4976865 A, US4976865, US4970002 A, US4970002, US4955363 A, US4955363, US4940548 A, US4938974 A, US4938974, US4938804 A, US4938804, US4873111 A, US4873111, US4857642 A, US4857642, US4837315 A, US4837315, US4732687 A, US4732687, US4724006 A, US4724006, US4666527 A, US4666527, US4636315 A, US4636315, US4631129 A, US4631129, US4599115 A, US4599115, US4533398 A, US4533398, US4519845 A, US4519845, US4518436 A, US4518436, US4498991 A, US4482761 A, US4472203 A, US4471114 A, US4461649 A, US4451489 A, US4426232 A, US4412866 A, US4412366 A, US4405455 A, US4404037 A, US4402832 A, US4391649 A, US4379751 A, US4368268 A, US4366060 A, US4359430 A, US4332623 A, US4313015 A, US4312678 A, US4293346 A, US4267054 A, US4259186 A, US4218438 A, US4213913 A, US4208284 A, US4182633 A, US4157267 A, US4145230 A, US4143169 A, US4104078 A, US4096036 A, US4075406 A, US4066711 A, US4008285 A, US4001112 A, US3982003 A, US3959519 A, US3928193 A, US3928062 A, US3884714 A, US3835043 A, US3826905 A, US3817787 A, US3814253 A, US3796657 A, US3784408 A, US3756855 A, US3743539 A, US3732982 A, US3730770 A, US3706812 A, US3704168 A, US3694158 A, US3692582 A, US3632656 A, US3627636 A, US3619369 A, US3607392 A, US3586537 A, US3579380 A, US3558725 A, US3539505 A, US3522172 A, US3513023 A,

US3494104 A, US3494103 A, US3493497 A, US3483031 A, US3480665 A, US3479248 A, US3474908 A, US3471329 A, US3468607 A, US3453811 A, US3436897 A, US3420709 A, US3416961 A, US3411342 A, US3407574 A, US3398512 A, US3374606 A, US3305395 A, US3298527 A, US3268605 A, US3250058 A, US3230167 A, US3214293 A, US3174876 A, US3134814 A, US3044906 A, US3044905 A, US3044904 A, US3021374 A, US2985589 A, US2949389 A, US2937959 A, US2911362 A, US2890972 A, US2868677 A, US2845136 A, US2818851 A, US2684331 A, US2588449 A, US2586295 A, US2524414 A, US2519573 A, US2375165 A, US2007971 A, SU445270, SU445270, SU1072818, SU1072818, RU445270, RU1072818, JP39005429, JP39005429, JP39005429, GB715774, GB715774, GB4349470, GB4349470, GB240053, GB2240053, GB1448524, GB1448524, GB1326765, GB1326765, FI875655, FI875655, FI875655, FI86416, FI86416, FI86416, FI77845, FI77845, FI77845, FI75503, FI75503, FI75503, FI68526, FI68526, FI68526, EP0663224 A1, EP0663224, EP0345511 A3, EP0345511 A2, EP0345511, EP0279946 A2, EP0279946, EP0101304 A2, EP0101304, EP0054544 B1, EP0054544, EP0054544, EP0010769 A2, EP0010769, DE4041414 A1, DE4041414, DE2511904, DE2511904, DE2362211, DE2362211, DE2300492, DE2300492, CA754511, CA754511,

Forward Citations: WO16073881, WO16061037, WO11121181, WO11121179, WO08097878, WO08097878, WO07144522, WO07144522, WO07144476, WO07128918, WO03097208, WO03026772, WO03026772, WO0222228, WO0222228, WO0173097, WO0173097, WO0050378, WO0050378, US9976194, US9963673, US9845514, US9783861, US9776945, US9663836, US9650687, US9631246, US9617608, US9512495, US9493851, US9476106, US9410216, US9395619, US9115467, US8951416, US8807164, US8465649, US8404109, US8394288, US8192629, US8182696, US8092609, US7959811, US7935189, US7790040, US7763116, US7544293, US7407586, US7229558, US7166460, US7141172, US7141172, US7128833, US7022239, US6896811, US6875349, US6821535, US6812000, US6805799, US6770757, US6685781, US6663780, US6649066, US6482268, US6462221, US2011245491, US2011245487, US2010297290, US2010213130, US2010212662, US2010038313, US2009209736, US2008053543, US2007169772, US2006273013, US2005256307, US2005236332, US2005208615, US2004129137, US2004118781, US2003216543, US2003213749, US2003173299, US2003006191, US10041138, KR101828634, KR101761442, KR101376311, JP5815666, JP2013529603, JP2013523935, JP2013523107, FR2900654, EP2878349, EP2555844, EP2555844, EP2552562, EP2552562, EP2401048, EP2401047, EP2401046, EP2401046, EP2316551, EP1839497, EP1734108, EP1333103, EA026098, DE10036189, CN105017339, CN103201003, CN103201003, CN102946962, CN102946962, CN102946961, CN102413891, CN102413891, CN102413890, CN102413890, CN102405085, CN102405085, CN101928305, CN101899486, AU2007202885,

Abstract:

A method for fractionating a solution into two or more fractions by a chromatographic simulated moving bed (SMB) process, wherein the separation system comprises at least two separation profiles in the same loop.



5) Family number: 1981585 (US4412866A)

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Title: METHOD AND APPARATUS FOR THE SORPTION AND SEPARATION OF DISSOLVED CONSTITUENTS
Priority: US19810267065 19810526 CA19820403617 19820525 EP19820902128 19820525
WO1982US00712 19820525

Family:	Publication number	Publication date	Application number	Application date
	AT36121 E	19880815	AT19820902128T	19820525
	AU198286884 A1	19821221	AU19820086884	19820525
	AU550674 B2	19860327	AU19820086884	19820525
	BR8207712 A	19830510	BR19820007712	19820525
	CA1182052 A1	19850205	CA19820403617	19820525
	DE3278851 D1	19880908	DE19823278851	19820525
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	EP0079948 A4	19850218	EP19820902128	19820525
	EP0079948 B1	19880803	EP19820902128	19820525
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	JP58500794 T2	19830519	JP19820502121T	19820525
	US4412866 A	19831101	US19810267065	19810526
	WO8204265 A1	19821209	WO1982US00712	19820525
	ZA8203645 A	19830330	ZA19820003645	19820526

Probable Assignee: AMALGAMATED RESEARCH INC

Assignee(s):(std): AMALGAMATED SUGAR CO

Assignee(s): AMALGAMATED SUGAR CO A CORP OF UT ; AMALGAMATED SUGAR CO THE ; AMALGAMATED SUGAR COMPANY THE ; THE AMALGAMATED SUGAR COMPANY ; AMARUGAMEITETSUDO SHUGAA CO ZA ; THE AMALGAMATED SUGAR CO ; SCHOENROCK KARLHEINZ WR ; KEARNEY MICHAEL M ; REARICK D EUGENE ; AMALGAMATED RESEARCH INC

Inventor(s):(std): KEARNEY M M ; KEARNEY MICHAEL M ; REARICK D ; REARICK D EUGENE ; REARICK EUGENE D ; SCHOENROCK K W ; SCHOENROCK K W R KEARNEY M M R ; SCHOENROCK KARLHEINZ W R

Inventor(s): SCHOENROCK KARLHEINZ WR ; SCHOENROCK KW ; SCHOENROCK KWR ; SCHOENROCK KWR KEARNEY MM REARICK DE ; SHAAIROTSUKU KAARUHAINTSU DABURYUU AARU ; KAANII MAIKERU EMU ; SCHOENROCK K W R KEARNEY M M REARICK D E ; RIARITSUKU DEI YUJIN ; REARICK DE ; KEARNEY MM

Agent(s): GRIFFITH HACK; JOHNSON AND HICKS

Designated states: AT AU BE BR CH DE FR GB JP LU NL SE

International class (IPC 8-9): B01D15/00 B01D15/04 B01D15/18 B01D53/04 B01D53/08 B01J47/02 B01J47/10 C13B20/14 C13D3/14 C13K3/00 (Advanced/Invention); B01D15/00 B01D53/04 (Advanced/Non-invention); B01D15/00 B01D15/10 B01D53/04 B01J47/00 C13K3/00 (Core/Invention)

International class (IPC 1-7): B01D15/00 B01D15/04 B01D53/08 B01J47/00 B01J47/02 C13D3/12 C13D3/14 C13K3/00

CPC: B01J47/11 C13K3/00 B01D15/1828 B01D2215/023

European class: B01D15/18R2A B01J47/10B C13K3/00 L01D215/02F

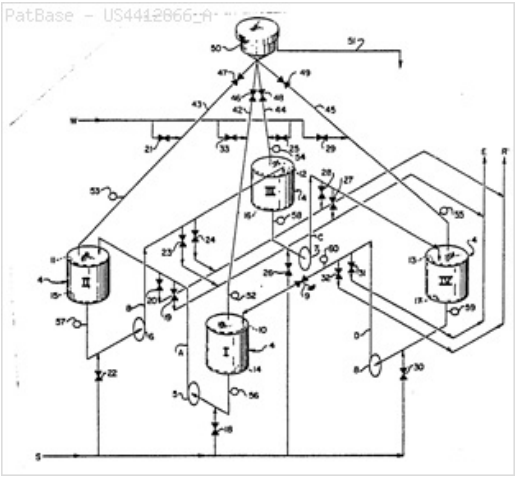
US class: 127/46.2 210/656 210/662 210/676 210/739 210/741

[Classification Explorer](#)

Cited documents: US4269715 A, US4182633 A, US4157267 A, US4085042 A, US4001113 A, US3779384 A, US3777888 A, US3706812 A, US3268605 A, US3231492 A, US2985589 A, JP54152668 A2, JP54090072 A2, JP51018392 A2,

Forward Citations: WO9830724, WO9745185, WO9108815, WO9103298, WO8402854, WO19018406, WO16061037, WO12045985, WO12008830, WO05009578, WO05009578, US9969517, US9931584, US9878816, US9802730, US9624018, US9387971, US9211968, US9163050, US9150938, US9145223, US8937191, US8865948, US8802843, US8741146, US8721894, US8720163, US8584879, US8381940, US8152010, US8127955, US7931751, US7862715, US7838454, US7662234, US7479228, US7368059, US7229558, US7150793, US7141172, US7141172, US6896811, US6875349, US6740243, US6685781, US6663780, US6656287, US6649066, US6602420, US6572775, US6482268, US6451123, US6431202, US6379554, US6296772, US6224776, US6214125, US6200390, US6187204, US6096218, US6093326, US6063284, US5795398, US5630943, US5556546, US5466795, US5424418, US5173179, US5156736, US5149436, US513869, US5124133, US5122275, US5102553, US5071547, US5064539, US4999102, US4990259, US4968353, US4915843, US4808317, US4764276, US4704263, US4511476, US2011163038, US2009151715, US2008093302, US2007275153, US2007056909, US2007023033, US2006273013, US2006261010, US2005173314, US2005167365, US2005061744, US2004129137, US2004082776, LT3704, JP4032364, FR2766385, EP2960209, EP2960209, EP1463587, EP0910448, EP0880984, EP0593368, EP0495640, AT412258,

Abstract:
A simulated moving bed process divides the bed into separate zones, each of which includes one or more discrete vessels. The zones correspond to the functions of the process; typically sorption, displacement, elution and regeneration. Booster pumps in series with the vessels maintain a desired pressure head for each zone. The functions of each zone are rotated in sequence, the sequence being timed in relation to the migration of the front between adjacent phases in the fluid loop circulating through the zones.



6) Family number: 29612765 (US2002027104A) © PatBase

Title: Method of displacement chromatography

Priority: US19970036603P 19970129 WO1998US01512 19980128 US19990355415 19991118
US20010956580 20010919

Family:	Publication number	Publication date	Application number	Application date
	AU199860435 A1	19980818	AU19980060435	19980128
	BRPI9807521 A	20000321	BR1998PI07521	19980128
	EP1017467 A1	20000712	EP19980903747	19980128
	EP1017467 A4	20011121	EP19980903747	19980128
	EP1017467 B1	20140716	EP19980903747	19980128
	JP2001509730 T2	20010724	JP19980532219T	19980128
	JP4185572 B2	20081126	JP19980532219T	19980128
	US2002027104 AA	20020307	US20010956580	20010919
	US6379554 BA	20020430	US19990355415	19991118

US6602420 BB	20030805	US20010956580	20010919
WO9832514 A1	19980730	WO1998US01512	19980128

Probable Assignee: AMALGAMATED RESEARCH LLC

Assignee(s):(std): AMALGAMATED RES INC ; AMALGAMATED RES LLC ; AMALGAMATED RESEARCH INC ; KEARNEY MICHAEL M ; KOCHERGIN VADIM N

Assignee(s): AMALGAMATED RESEARCH LLC

Inventor(s):(std): KEARNEY MICHAEL M ; KOCHERGIN VADIM N

Inventor(s): VADIM N KOCHERGIN ; MICHAEL M KEARNEY

Agent(s): COYLE PHILIP AIDAN

Designated states: AL AM AT AU AZ BA BB BE BF BG BJ BR BY CA CF CG CH CI CM CN CU CZ DE DK EE ES FI FR GA GB GE GH GM GN GR HU IE IL IS IT JP KE KG KP KR KZ LC LK LR LS LT LU LV MC MD MG MK ML MN MR MW MX NE NL NO NZ PL PT RO RU SD SE SG SI SK SN SZ TD TG TJ TM TR TT UA UG US UZ VN ZW

International class (IPC 8-9): B01D15/00 B01D15/08 B01D15/18 B01D15/42 G01N30/02 G01N30/88 (Advanced/Invention); B01D15/00 G01N30/02 (Advanced/Non-invention)

International class (IPC 1-7): B01D15/00 B01D15/08 G01N30/88

CPC: B01D15/1864 B01D15/1828 B01D15/422 G01N30/02

European class: B01D15/18R2A B01D15/18T B01D15/42D S01N30/02

US class: 127/46.2 127/46.3 210/198.2 210/656 210/656S 210/659

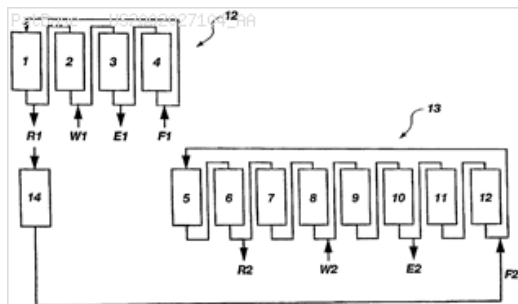
[Classification Explorer](#)

Cited documents: WO9610650 A1, WO9417213 A1, US6093326 A, US5851408 A, US5851405 A, US5795398 A, US5730877 A, US5384035 A, US5382294 A, US5177008 A, US5127957 A, US5102553 A, US5102533 A, US4940548 A, US4631129 A, US4519845 A, US4412866 A, US4405455 A, US4379751 A, US4359430 A, US4332623 A, US4313015 A, US4213913 A, US4104078 A, US4001112 A, US2985589 A, JP2124895 A2, EP0411780 A2,

Forward Citations: WO16061037, WO13166469, WO13082018, WO11141294, WO09106734, WO07144522, WO07144522, WO07144476, WO06131286, US9790162, US9783861, US9771542, US9695382, US9694302, US9650687, US9631246, US9493851, US9493392, US9428711, US9370730, US9347020, US9321715, US9315762, US9260677, US9234157, US9163050, US9150816, US9080221, US8937191, US8807164, US8802880, US8802843, US8465649, US8293115, US8192629, US8182696, US8153009, US8017017, US7959812, US7959811, US7931751, US7790040, US7749390, US7662234, US7544293, US7407586, US7166460, US7128833, US7022239, US7009076, US6875349, US6863824, US6685781, US6663780, US6649066, US6576134, US6572775, US6482268, US6224776, US6214125, US6187204, US6093326, US2012189514, US2011120952, US2010326918, US2010230341, US2010213130, US2010212662, US2009194482, US2009151715, US2008283739, US2008053543, US2007023033, US2005236332, US2005208615, US2003222024, US2003217970, US2003213749, US10179759, FR2925349, EP2923749, EP2878614, EP2878349, EP2862890, EP2613858, EP2613858, EP2401048, EP2401047, EP2401046, EP2401046, EP2319599, EP2319599, EP2116554, EP1649068, EP1649068, EP1333103, EP1018561, CN102884046, CN102884046, CN102143789, AU2008351969,

Abstract:

A plurality of chromatographic separation operations, including a first simulated moving bed operation, are coupled into a process which functions, preferably through the application of continuous displacement chromatography, to recover a fraction rich in small organic molecules, notably betaine and/or invert from sucrose solutions, enabling the subsequent production of a high purity sucrose product.



7) Family number: 23925776 (US2002035269A)

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Title: METHOD FOR SEPARATING A BASIC AMINO ACID FROM FERMENTATION BROTH

Priority: US20000192891P 20000329 US20000192892P 20000329 US20010263228P 20010123
US20010266473P 20010206 JP20010570604 20010315 US20010808121 20010315
WO2001US08109 20010315 US20010808123 20010315 WO2001US08248 20010315
WO2001US08109 20020927

Family:	Publication number	Publication date	Application number	Application date
	AT273269 E	20040815	AT20010914806T	20010315
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	AU2001240151 BB	20050602	AU20010240151	20010315
	AU2001245737 AA	20011008	AU20010245737	20010315
	AU200140151 A1	20011008	AU20010040151	20010315
	AU200140151 A5	20011008	AU20010040151	20010315
	AU200145737 A1	20011008	AU20010045737	20010315
	AU200145737 A5	20011008	AU20010045737	20010315
	CA2404442 AA	20020927	CA20012404442	20010315
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	DE60104833 D1	20040916	DE20016004833T	20010315
	DE60104833 T2	20050324	DE20016004833T	20010315
	DK1268399 T3	20041206	DK20010914806T	20010315
	EP1268399 A2	20030102	EP20010914806	20010315

EP1268399 B1	20040811	EP20010914806	20010315
EP1268838 A2	20030102	EP20010918689	20010315
ES2225499 T3	20050316	ES20010914806T	20010315
JP2003528602 T2	20030930	JP20010570604T	20010315
JP2011177709 A2	20110915	JP20110076405	20110330
JP5530389 B2	20140625	JP20110076405	20110330
KR100726204 B1	20070611	KR20027012855	20010315
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US2002035269 AA	20020321	US20010808123	20010315
US2002133049 AA	20020919	US20010808121	20010315
US6479700 BB	20021112	US20010808123	20010315
US6479716 BB	20021112	US20010808121	20010315
WO0172689 A2	20011004	WO2001US08109	20010315
WO0172689 A3	20020321	WO2001US08109	20010315
WO0173097 A2	20011004	WO2001US08248	20010315
WO0173097 A3	20020228	WO2001US08248	20010315
ZA200208705 A	20040203	ZA20020008705	20021028

Probable Assignee: ARCHER DANIELS MIDLAND CO

Assignee(s):(std): BINDER THOMAS P ; AHMAD K HILALY ; ARCHER DANIELS MIDLAND CO ; HILALY AHMAD K ; THOMAS P BINDER

Assignee(s): ARCHER DANIELS MIDLAND COMPANY ; ARCHER DANIELS MIDLAND CO DECATUR ; HILALY AHMAD ; SOPER JOHN ; MOORE KEVIN

Inventor(s):(std): BINDER THOMAS P ; HILALY AHMAD ; BINDER P ; BINDER P THOMAS ; MOORE KEVIN ; SOPER JOHN ; HILALY AHMAD K

Inventor(s): P THOMAS BINDER ; AHMAD HILALY ; AHMAD K HILALY ; KEVIN MOORE ; JOHN SOPER ; THOMAS P BINDER

Agent(s): PETER MAXWELL AND ASSOCIATES; GOUDREAU GAGE DUBUC

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EE ES FI FR GA GB GD GE GH GM GN GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NE NL NO NZ PL PT RO RU SD SE SG SI SK SL SN SZ TD TG TJ TM TR TT TZ UA UG UZ VN YU ZA ZW

International class (IPC 8-9): A23K1/16 B01J39/04 B01J39/26 B01J49/00 C07C227/40 C07C229/26 C07C29/76 C07D233/61 C12P13/08 C12P13/10 C12P13/24 C12P7/18 (Advanced/Invention); C07C227/40 C07C229/26 (Advanced/Non-invention); C07C227/00 C07C229/00 C07C29/00 C12P7/02 (Core/Invention); C07C (Subclass/Invention)

International class (IPC 1-7): A23K1/16 C07C C07C227/00 C07C227/40 C07C229/00 C07C229/26 C07C27/26 C07C29/74 C07C31/18 C07C31/20 C07D209/20 C07D233/61 C12P13/08 C12P13/10 C12P13/24 C12P7/18

CPC: C07C227/40 C07C29/76 C12P7/18

European class: C07C227/40 C07C29/76 C12P7/18

US class: 548/339.1 548/339.100P 548/497 548/497S 562/553 562/554 562/554S 568/868 568/872 568/872P

[Classification Explorer](#)

Cited documents: WO9745185 A1, WO9635795 A1, WO9618596 A1, US5985589 A, US5841003 A, US5821092 A, US5731478 A, US5723389 A, US5689016 A, US5684190 A, US5652348 A, US5356812 A, US5254467 A, US5164309 A, US5015789 A, US5008473 A, US4962027 A, US4714767 A, US4052401 A, US3864406 A, US2985589 A, JPS62292750, JPS6124548, JP62292750 A2, JP61024548 A2, JP5192089 A2, JP4134054 A2, JP1209366 A2, FR2666996 A1, EP1103618 A1, EP0533039 A1, EP0361082 A2, EP0337440 A2, EP0261554 A2,

Forward Citations: WO16164767, WO16061037, WO14006108, WO09064335, WO07095261, WO04101479, WO04101479, US9968531, US9668951, US9375390, US9242930, US9109244, US8802729, US8598231, US8568700, US8399717, US8372606, US8183417, US8177980, US8066923, US8048920, US7988883, US7960575, US7919658, US7759393, US7572376, US7488855, US7056439, US6756510, US2016297746, US2010105841, US2009291477, US2009120878, US2008176957, US2008097130, US2007275139, US2007241306, US2007213247, US2007207940, US2007207939, US2007207113, US2007203276, US2007202580, US2007202126, US2007202073, US2007202062, US2007200088, US2007200087, US2007161784, US2006124545, US2006106226, US2004222153, US2004140060, US10086339, US10035749, TWI386488, KR20160071376, JP2015517323, JP2009506783, JP2008500823, EP2852676, EP2239334, CN104725258, CN104725258, CN104540954, CN103739507, CN103304374, CN102816048, CN102372599,

Abstract:

This invention relates to a method for separating basic amino acids from fermentation broth comprising contacting the broth with strong acid cation exchange resins that have a low degree of cross-linkage and eluting the amino acid. The method described herein results in higher yield and higher purity of lysine, in addition to higher throughput, as compared to conventional processes of purification of lysine from fermentation broth.

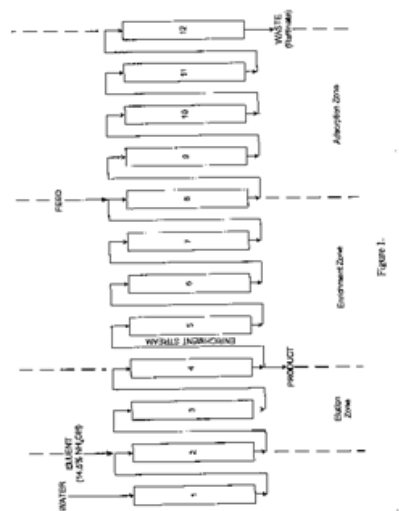


Figure 1

8) Family number: 31492831 (US2005056273A)

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Title: METHOD FOR PURIFICATION OF HIGH PURITY SUCROSE MATERIAL

Priority: US20030487706P 20030716 EP20040777844 20040709 WO2004US22010 20040709
US20040888155 20040709 US20060543511 20061005 US20090372356 20090217

Family:	Publication number	Publication date	Application number	Application date
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	WO05010216 A2	20050203	WO2004US22010	20040709
	WO05010216 A3	20051229	WO2004US22010	20040709

Probable Assignee: AMALGAMATED RESEARCH LLC

Assignee(s):(std): AMALGAMATED RES INC ; AMALGAMATED RES LLC ; COSTESSO DENNIS D ; KEARNEY MICHAEL M

Assignee(s): AMALGAMATED RESEARCH INC ; AMALGAMATED RESEARCH LLC ; AMALGAMATED RESEARCH LLC TWIN FALLS

Inventor(s):(std): KEARNEY MICHAEL M ; KEARNEY MICHAEL ; COSTESSO DENNIS D ; COSTESSO DENNIS ; ARNEY MICHAEL M

Inventor(s): MICHAEL M ARNEY ; KEARNEY MICHAEL M TWIN FALL ; DENNIS D COSTESSO ; COSTESSO DENNIS D OGDEN

Agent(s): MARKS AND CLERK LUXEMBOURG LLP; MORELAND DAVID; CARPINTERO MARIO; TRASK BRITT; WESTMAN CHAMPLIN AND KELLY PA; TRASKBRITT PC; DAVID D

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

International class (IPC 8-9): B01D15/08 B01D15/12 B01D15/18 B01D15/36 B01D15/42 C13B20/14 C13B20/16 C13B30/06 C13B35/06 C13D3/14 C13D3/16 C13F1/06 C13J1/06 C13K13/00 (Advanced/Invention); B01D15/26 (Core/Invention); C13D (Subclass/Invention)

International class (IPC 1-7): C13D3/14 C13J1/06

CPC: B01D15/1821 B01D15/362 C13B20/14 C13B20/148

European class: B01D15/18R2 B01D15/36B2 C13B20/14 C13B20/14H

US class: 127/30 127/42 127/46.2 127/46.200 127/46.200P 127/53 127/53S 127/55 127/55S 127/56 127/56S

[Classification Explorer](#)

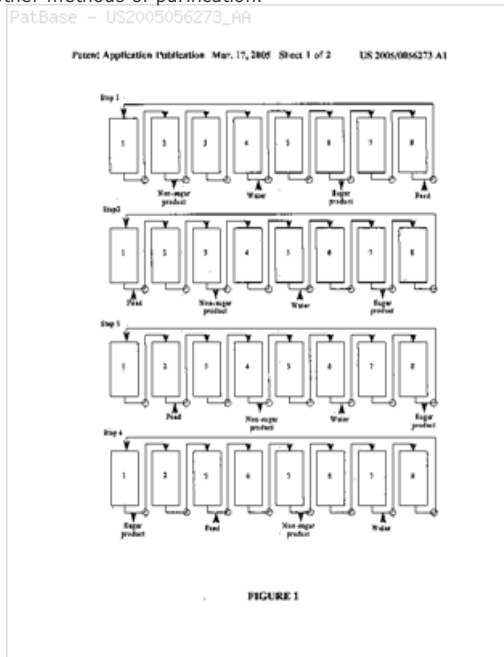
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US2004006222 AA, US2001001178 AA,

Forward Citations: WO19018406, WO16064493, WO16061037, WO13177058, WO09106734, US9548938, US9163050, US8802843, US8568683, US8512475, US7959812, US7931751, US7922989, US7662234, US2011176984, US2010326918, US2010307485, US2010160624, US2009151715, US2007217988, US2007023033, JP6461017, JP5815666, JP2016515043, JP2013523935, FR2925349, EP3206771, EP2272990, EP2272990, EP2001797,

Abstract:

A method for purifying a sucrose material already in a high purity liquid, crystalline or other form of sucrose, such as raw sugar, utilizing chromatography, or utilizing chromatography in connection with other methods of purification.



9) Family number: 30949906 (US4024331A)

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Title: PROCESS FOR SEPARATING A KETOSE FROM AN ALDOSE BY SELECTIVE ADSORPTION

Priority: US19760690768 19760527 US19760690769 19760527 US19760702831 19760706
CA19770278075 19770510 MX19770169229 19770530 US19780890778 19780327
US19780973298 19781226 US19790074856 19790913 US19800197874 19801017
US19800203786 19801103 US19820374819 19820504 US19830532248 19830914

Family:	Publication number	Publication date	Application number	Application date
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YU129177 A	19820630	YU19770001291	19770524
ZA7702867 A	19780426	ZA19770002867	19770513

Probable Assignee: UOP INC A DE CORP

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Assignee(s): UOP DES PLAINES IL A NY GENERAL PARTNERSHIP ; UOP INC DES PLAINES ILL US ; UOP INC A CORP OF DE ; UOP INC A DE CORP ; NEUZIL RICHARD W ; PRIEGNITZ JAMES W ; UOP A GENERAL PARTNERSHIP OF NY ; UOP DES PLAINES IL A GENERAL PARTNERSHIP OF NY

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Inventor(s): NEUZIL R W AND PRIEGNITZ J W ; PRIEGNITZ JAMES WILLIAM ELGIN ILL US ; PRIEGNITZ JAMES WILLIAM ELGIN ILL ; WILLIAM PRIEGNITZ JAMES ; WILLIAM NEUZIL RICHARD ; J W PRIEGNITZ ; NEUZIL RICHARD WILLIAM DOWNERS GROVE ILL US ; NEUZIL RICHARD WILLIAM DOWNERS GROVE ILL ; R W NEUZIL

Agent(s): WM; WATERMARK INTELLECTUAL PROPERTY PTY LTD; MACRAE AND CO

International class (IPC 8-9): B01J20/281 B01J20/284 C07H1/06 C07H3/00 C07H3/02 C12P19/24 C13K1/00 C13K11/00 C13K3/00 G01N30/88 (Advanced/Invention); B01J20/281 C07H3/00 C13K1/00 C13K11/00 (Advanced/Non-invention); B01J20/281 C07H1/00 C07H3/00 C12P19/00 C13K1/00 C13K11/00 C13K3/00 G01N30/00 (Core/Invention)

International class (IPC 1-7): B01D15/04 B01D15/06 B01J19/04 C07G3/00 C07H1/06 C07H3/02 C10G C12P19/24 C13K C13K1/00 C13K11/00 C13K13/00 C13K3/00

CPC: Y10S435/803 C12P19/24 C07H1/06 C13K3/00

European class: C07H1/06 C12P19/24 C13K3/00

US class: 127/46.1 127/46.2 127/46.3 127/9 210/264 210/424 210/676 435/288 435/803 435/813 435/94 536/1 536/1.1 536/1.11 536/100 536/124 536/127

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Forward Citations: WO9617858, WO15034643, WO14168697, WO12050625, WO12050625, WO12045985, USRE33105, US9441280, US9255120, US8865948, US8729256, US7618671, US6987183, US6872314, US6770757, US5876505, US5800624, US5656094, US5466795, US5424418, US5350456, US5340404, US5234503, US5230742, US5146874, US5071530, US5026482, US4910336, US4880920, US4880919, US4876390, US4857642, US4837315, US4692514, US4664718, US4617637, US4591388, US4588847, US4572742, US4533633, US4516566, US4483980, US4471114, US4442285, US4409033, US4404037, US4394178, US4325742, US4287001, US2011207923, US2005202140, US2005045560, JP53024038, JP2005513161, FR2727968, FR2595715, EP3401322, EP3206771, EP3067362, EP3041961, EP1341935, EP0796268, EP0593368, EP0237442, EP0237442, EP0104911, EP0104911, EP0101304, EP0101304, EP0074815, EP0074815, CN103288887, CN103288887,

Abstract:

A process for separating a ketose from a feed mixture comprising a ketose and an aldose which process comprises contacting the mixture with an adsorbent comprising a X zeolite containing one or more selected cations at the exchangeable cationic sites thereby selectively adsorbing a ketose from the feed mixture and thereafter recovering the ketose. Preferably the ketose will be recovered by desorption from the adsorbent with a desorbent material.

