COEI-1-RESECA Cation exchange resins

1. Objective, origin and scope of application

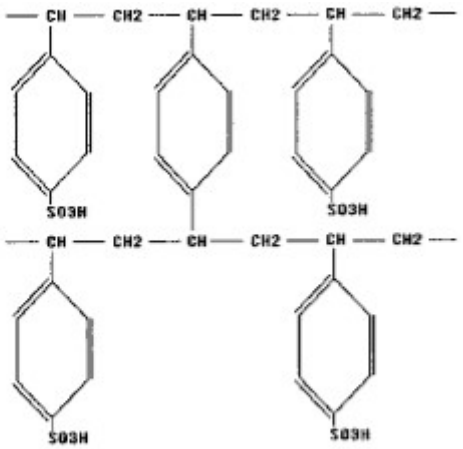
Ion exchange is the reversible exchange of ions between a liquid and a solid, during the course of which the solid does not undergo any substantial changes. When this technique is applied to wine, the solid is an insoluble, permeable synthetic resin capable of exchanging ions with the wine with which it is in contact.

These resins are used in the tartaric stabilization of wine.

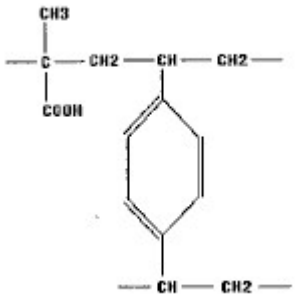
2. Composition

Cation exchange resins may be prepared in an appropriate physical form using one or more of the following formulas.

Sulfonated styrene-divinylbenzene copolymer:



Divinylbenzene-methacrylic acid copolymer



Resin inertia must be satisfactory.

The substances which can be used in the manufacture of these resins are indicated in Annexes 1 and 2.

The resin should not contain more than 1 mg of extractable organic substance per kg. These organic extracts are obtained with each of the following solvents: a) distilled water, b) alcohol, 15% by volume, c) 3% acetic acid solution (m/m).

The resin must have been washed and conditioned in accordance with the manufacturer's instructions.

Prepare different ion exchange columns for each solvent, using 50 ml of the resin that has previously been weighed.

While maintaining the maximum temperature that may be encountered during use, pass the three solvents used in the analysis (distilled water, 15% hydroalcohol ic solution and 3% acetic acid solution (m/m)) through the resins at a flow rate of 350-450 ml per hour.

The first liter of effluent from each solvent should not be considered for analytical purposes; only the following two liters of each solvent should be used to analyze the organic extracts.

Total extract: The two liter sample should be evaporated at 105 °C until a constant weight is obtained.

Ash: This dry residue derived drom evaporation of the 2 liters of effluent is then burned in an oven at 850 °C until a constant weight is obtained.

Organic extract: Total extract minus total ash gives the organic extract. If the organic extract is greater than 1 ml/l of solvent used, a "blank" should be made using the solvent and a correction should be made by subtracting the organic extract found in the "blank" from that obtained during the resin test. The solvents used are prepared as follows:

Control reagents: Distilled and/or de-ionized water.

Ethyl alcohol at 15% by volume obtained from absolute ethyl alcohol and distilled and/or de-ionized water.

3% acetic acid produced by mixing 3 parts (by mass) of acetic acid with 97 parts (by mass) of distilled and/or de-ionized water.

3. Limits

- The treatment must not alter the nature of the wine.
- The treatmnt must not reduce the color intensity of the wine.
- The treatment must not decrease the concentration of metallic cations in the wine below 300 mg/l.
- The treatment must not lower the wine's pH below 3.0. The decrease in pH should not exceed 0.3 pH units.
- The resin must not leave substances in the wine or impart to it characteristics (as a result of the resin-based treatment) that do not ordinarily exist in wine.
- The winemaker may use conditioning agents and/or regenerants composed of water and inorganic acids, bases or salts, provided that the conditioned or regenerated resin is washed in water until all conditioning agents and regenerants are removed before adding the wine.

Annex 1:List of substances used in the manufacture of adsorbant ion-exchange resins used to condition foodstuffs.

List 1Substances assessed by an international organization			
Name	PM/REF	Case	Restrictions
Monomers and other Starting substances			
n-butyl acrylate	10780	00141-32-2	-
Ethyl acrylate	11470	00096-33-3	-

Acrylonitrile	12100	00107-13-1	SML = ND
			(DL = 0.02 mg/kg)
			SML = 15 mg/kg
Formaldehyde	17260	00050-00-0	
Methyl methacrylate	21130	00080-62-6	-
Methanol	21550	00067-56-1	-
Styrene	24610	00100-42-5	-
Chemical Modifiers			
Carbonic acid, salts	42500	-	-
Hydrochloric acid	72640	07664-38-2	-
Silicic acid, salts	85980	-	-
Sulfuric acid	91920	07664-93-9	-
Acetic anhydride	10150	00108-24-7	-
tert-butyl-4-hydroxyanisole (BHA)	40720	25013-16-5	SML=30 mg/kg
Diethylene triamine	15790	00111-40-0	SML= 5 mg/kg
Dimethylamine	49225	00124-40-3	SML=0.06 mg/kg
2-(dimethylamino)ethanol	49235	00108-01-0	SML=18 mg/kg
Formaldehyde	54880	00050-00-0	SML=15 mg/kg
Hexamethylenediamine	18460	00124-09-4	SML=2.4 mg/kg

Potassium hydroxide	81600	01310-58-3	-
Sodium hydroxide	86720	01310-73-2	-
Sodium nitrite	86920	07632-00-0	SML=0.6 mg/kg
Ethylene oxide	17020	00075-21-8	MQ=1 mg/kg in FP
2-propanol	81882	00067-63-0	-
Polymerization Additives			
Akylsulfonic acids (C_8-C_{22})	34230	-	SML=6 mg/kg
Linear, primary alkylsulfuric	34281	-	-
acids (C_8-C_{22}) having an even number of carbon atoms			
Formic acid	55040	00064-18-6	-
Carboxymethylcellulose	42640	09000-11-7	-
Stannic chloride(IV)	93420	07646-78-8	-
Methylene chloride	66620	00075-09-2	SML=0.05 mg/kg
1,4-dihydroxybenzene	48620	00123-31-9	SML=0.6 mg/kg
Gelatin	55440	09000-70-8	-
Ammonium hydroxide	35600	01336-21-6	-
Magnesium hydroxide	64640	01309-42-8	-
Hydroxyethylcellulose	60560	09004-62-0	-
Hydroxethylmethylcellulose	60880	09032-42-4	-

Methanol	65960	00067-56-1	-
Methylcarboxymethylcellulose	66200	37206-01-2	-
Methyl isobutyl ketone	66725	00108-10-1	SML=5 mg/kg
Toluene	93540	00108-88-3	SML=1.2 mg/kg

Annex 2: Substances that may be used provisionally to manufacture ion-exchange resins.

List 2

Substances not fully evaluated by an international organization			
Name	PM/Ref	Case	Restrictions
Monomers and other starting substances			
Ethylene glycol dimethacrylate	20440	00097-90-5	-
Divinylbenzene	16690	01321-74-0	-
Diallyl ether of 1,1,1-tri-methylolpropane	25645	00682-09-7	-
2,3-epoxypropyl methacrylate	20590	00106-91-2	-
2-methyl-1,3-butadiene	21640	00078-79-5	-
1,7-octadiene	22585	03710-30-3	-
1,1,1-trimethylolpropane trimethacrylate	25840	03290-92-4	-
Chemical Modifiers			
N,N-dimethyl-1,3-diamino-propane	49380	00109-55-7	-

Triethylamine	95270	00121-44-8	-
Triethylene tetramine	25520	00112-24-3	-
Polymerization Additives			
Polyvinyl alcohols	81280	09002-89-5	-
4-tert-butylcatechol	40640	00098-29-3	-
Diisobutyl ketone	49050	00108-83-8	-
Sodium hypochlorite	62110	07681-52-9	-
Isobutanol	62270	00078-83-1	-
4-methoxyphenol	66030	00150-76-5	-
Methylene bis(sodium naphtha- lenesulfonate)	66600	26545-58-4	-
2-methyl-2-pentanol	66860	00108-11-2	-
Dibenzoylperoxide	46440	00094-36-0	
Partially hydrolyzed vinyl polyacetate	81260	-	-
Substances not evaluated by an international organization			
Name	PM/Ref	Case	Restrictions
Monomers and other starting substances			
Dimethoxymethane	-	00109-87-5	-
Diethylene glycol divinyl ether	-	00764-99-8	
Ethyl vinyl benzene	-	28106-30-1	-

1,2,4-trivinyl cyclohexane	-	02855-27-8	-
Chemical Modifiers			
Chlorosulfonic acid	-	07790-94-5	-
Monochloroacetic acid	-	00079-11-8	-
Phosphoric acid	-	13598-36-2	-
Bromine	-	07726-95-6	-
2-chloroethanol	-	00107-07-3	-
Methyl chloride	-	00074-87-3	-
1,2-dichloroethane	-	00107-07-3	-
1,2-dichloropropane	-	00078-87-5	-
3-(dimethylamino)propane	-	03179-63-3	-

Name	PM/Ref	Case	Prescriptions
Monomers and other starting substances			
Methylic chloromethyl ether	-	00107-30-2	-
Nitrobenzene	-	00098-95-3	-
Potassium nitrite	-	07758-09-0	-
Phthalimide	-	0085-41-6	-
Sulfur trioxide	-	07446-11-9	-
Trimethylamine	-	00075-50-3	-
Polymerization additives			
Lignosulfonic acid	63940	08062-15-5	-

Peracetic acid	-	00079-21-0	-
Polyacrylic acid	76460	09003-01-4	-
Poly(styrenesulfonic) acid	-	09080-79-9	-
Acrylamide/acrylic acid copolymer	-	09003-06-9	-
Ethoxylated, propoxylated tert-alkylamines (C_{12}-C_{14})	-	68603-58-7	-
Maleic anhydride-styrene copolymer, ammonium salt	-	26022-09-3	-
Attapulgite	-	12174-11-7	-
Azobisisobutyronitrile	-	00078-67-1	-
1,1-bis(tert-butylperoxy)-3,3,5-trimethylcyclohexane	-	06731-36-8	-
n-Dodecyl mercaptan	-	25103-58-6	-
Poly(ethylene/propylene)glycol monobutyl ester	-	09038-95-3	-
Polyethylene glycol octylphenyl ether	78560	09002-93-1	
Poly(ethylene-propylene/glycol ether with 1,1,1-tromethylol-propane	-	52624-57-4	-
tert-hexadecyl mercaptan	-	25360-09-2	-
Cumyl hydroperoxide	-	00080-15-9	-
Isododecane	62405	31807-55-3	-
Isooctane	-	26635-64-3	-

Mono- and dialkyl (C_{10}-C_{18}) Sulfonamides	-	-	-
Silver nitrate	-	07761-88-8	-
n-Octane	-	00111-65-9	-
tert-Butyl peracetate	-	00107-71-1	-
tert-Butyl perbenzoate	-	00614-45-9	-
bis(4-tert-butylcyclohexyte) percarbonate tert	-	15520-11-3	-
Butyl per(2-ethyl-hexanoate)	-	03006-82-6	-
tert-Butyl peroctanoate	-	13467-82-8	-
Dilauroyl peroxide	-	00105-74-8	-
Poly(diallyldimethylammonium chloride	-	26062-79-3	-
Polyvinylpyrrolidone	81500	09003-39-8	