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1999 PUBLICATIONS AND COMMUNICATIONS BY LAB FIRP ASSOCIATES

SALAGER J. L.,
Microemulsions,
in *Handbook of Detergents - part A: Properties,* G. Broze Ed., Surfactant Science Series vol. **82**, Chapter 8, pp 253-302, Marcel Dekker New York (1999)
ABSTRACT: After defining the term microemulsion and placing it in historical context, a self study section on phase behavior basics allow the reader to understand Winsor's studies and R ratio concept. The section on experimental phase diagram covers from simple true ternay to more complex cases, and the approximations that are used in practice, such as pseudoternary cuts. A state of the art section on numerical approach to physico-chemical formulation starts from early methods such as HLB and PIT to end up with a complete coverage of the surfactant affinity difference (SAD) concept and how to use it in practice through the formulation scan method. The attainment of a bicountiuous microemulsion at the so-called optimum formulation is associated with the maximum solubilization of oil and water in a single phase according to Winsor's premises. The section on advanced solubilization techniques includes the addition of a polar oil which was called lipophilic linker, and the use of new surfactants containing a slightly polar chain in between the hydrophilic and lipophilic conventional groups. These extended surfactants are found to solubilize polar oils, including natural triglycerides. The last section is dedicated to a short survey of current and potential applications of microemulsions. This chapter contains 25 figures, 166 references and 2 tables of numerical data.

SALAGER J. L., ANDEREZ J. M., ANTON R. E., BRACHO C., BRICEÑO M., MINAÑA M., ROJAS O.,
La Formulación Fisico-química de los Sistemas Sispersados - Del arte a la ciencia,
invited lecture, *IV Congreso Venezolano de Química,* Mérida Venezuela Feb. 7-11, 1999. Memorias pp. 11-14
ABSTRACT: Hasta hace poco tiempo preparar una emulsión, una espuma o una suspensión sólida era una operación que implicaba proceder según un récipe bien preciso. Hace ya varias décadas que se había diagnosticado el origen de los fenómenos en la superficie gas-líquido o en la interfase líquido-líquido o sólido-líquido. Sin embargo el gran número de fenómenos y la complejidad de sus interacciones hacía prácticamente imposible la utilización práctica de estos conocimientos básicos. La experiencia empírica que prevalecía en la ingeniería de los procesos y de los productos. Los esfuerzos investigativos desarrollados en la década de los 70 para mejorar la recuperación del petróleo mediante inyección de surfactante permitieron poner orden en esto y asentar las bases del know-how requerido para formular sistemas dispersos. No solo se entienden

los fenómenos, sino que se pueden ahora colocar en forma numérica una serie de relaciones de causa a efecto, lo que permite al formulador predecir propiedades antes de llevar a cabo experimentos. Hoy en día se dispone de una comprensión suficiente para entender el porqué de los complejos protocolos de fabricación de cremas cosméticas, de pinturas, de productos alimenticios, de agentes antiespumantes, de emulsiones de corte, de la Orimulsión®, y otros sistemas dispersados. No es que se sabe todo, sino que ahora se sabe lo que se sabe y quizás más importante, se sabe lo que no se sabe y en que marco referencial habrá de estudiarlo.

YSAMBERTT F., MARQUEZ N., SALAGER J. L., LACHAISE J., GRACIAA A.,
Influencia de Aceites Aromáticos en el Fraccionamiento de Alquilfenoles Etoxilados en Sistemas Surfactante-agua-aceite,
oral presentation, *IV Congreso Venezolano de Química,* Mérida Venezuela Feb. 7-11, 1999. Paper Nº 059. Memorias pp 170-173
ABSTRACT: The partitioning of commercial nonionic surfactants is discussed in two cases of oil phase: first aliphatic oils (hexane-tetradecane mixtures) and then aliphatic-aromatic mixtures. In the first case a slight partitioning is observed , while in the second case a strong partitioning is found to increase as the aromatic content rises, probably due to the segregation of the aromatic oil near the interface. The partitioning coefficient is related to the physico-chemical conditions and the number of ethylene oxide groups.

BURGUERA J. L., QUINTANA I., SALAGER J. L., BURGUERA M., RIVAS C., RONDON C., CARRERO P.,
El uso de surfactantes para la determinación y especiación de mercurio en aceite de huevas de pescado por flujo continuo - espectroscopia de absorción atómica con generación de vapor frio de mercurio,
oral presentation, *IV Congreso Venezolano de Química,* Mérida Venezuela Feb. 7-11, 1999. Paper Nº 193. Memorias pp. 485-488
ABSTRACT: A new method is developed for the determination of the different mercury species in fish-eggs oil by cold vapor generationin a flow injection system with atomic adsorption spectroscopic detection. The surfactants Tween 80, Tween 85 and Tween 20 were used for oil-water emulsion formulation with a high content of oleic phase and low viscosity. The determination of the inorganic and organic mercury species was possible using a time-based injector in order to introduce the sample and reagents in an on-line system. In all cases, good recovery values, a linear working range from 1 to 10 microgram Hg/l, a detection limit of 1 microgram/l, and a good agreement with the total mercury levels obtained by electrochemical atomic absorption spectroscopy were attained.

MARQUEZ N., SUBERO N., BRAVO B., CHAVEZ G., YSAMBERTT Y., SALAGER J.L.
Fraccionamiento de Surfactantes Alcoholes Etoxilados por Cromatografía Líquida de Alta Precisión,
oral presentation, *IV Congreso Venezolano de Química,* Mérida Venezuela Feb. 7-11, 1999. Paper Nº 211. Memorias pp 532-534
ABSTRACT: Commercial ethoxylated surfactants are made by a polycondensation reaction that result in a distribution of EON that I many cases obeys Poisson's law. As a consequence these surfactants are always a mixture. The different oligomers are separated by HPLC techniques. The optimization variable is the solvent mixture polarity. Silica columns allow to separate

oligomers up to EON=8 using heptane/chloroform/methanol mixtures as the mobile phase. Furthermore, the mixture heptane/isopropanol allows to improve the separation. Extreme separation of wide range EON distribution is attained using an amino column.

MIÑANA-PEREZ M., GUTRON C., ZUNDEL C., ANDEREZ J. M., SALAGER J.L.,
Miniemulsion Formation by Transitional Inversion,
J. Dispersion Science & Technology **20** (3) 893-905 (1999)
ABSTRACT: Very fine emulsions with droplet size in the sub-micron range, often called miniemulsions, are prepared by the moderate (magnetic) stirring of a system undergoing a dynamic transitional inversion driven by a continuous change in physico-chemical formulation (here temperature). Near optimum formulation for three-phase systems, the ultraslow interfacial tension favors the drop breaking rate, and fine emulsions can be made. However, this region is also known for its rapid coalescence rate. Thus, a high enough stability can be attained only by shifting the formulation away from optimum as soon as the emulsion is made. Moreover, a rapid change in formulation through the three-phase region also results in a separation phenomenon that can be harnessed to produce ultra fine droplets. The phase behavior of surfactant-oil-water systems and emulsion properties (type, droplet size and stability) are studied as a function of surfactant concentration (2 wt.% and 6 wt.%), for two different nonionic surfactants (polyoxyethylene tri-terbutyl ethers and sorbitan derivatives) with HLB ranging from 4 to 16. Kerosene and paraffin oil are used as oil phases. The transitional inversion form W/O to O/W is induced by a rapid cooling of the stirred systems from above to below the optimum temperature for three-phase behavior. Miniemulsions are attained when the surfactant concentration is high enough, and when the temperature quenching span covers an appropriate range related to phase behavior.

ROJAS O. J., NEUMAN R. D.,
Adsorption of Polysaccharide Wet-End Additives in Papermaking Systems,
Colloids and Surfaces A: Physicochemical and Engineering Aspects **155**, 419-432 (1999)
ABSTRACT: The adsorption of polysaccharide guar gum and starch additives and their interactions with cellulosic fibers and fines, as well as soluble and colloidal carbohydrates, present in wood plup suspensions were investigated by employing HPLC and spectrophotometry. A unique phenomenon, i.e., carbohydrate uptake or "substraction", was observed to occur in a variety of cellulosic systems [whole pulp, washed/screened pulp, alkali-extracted pulp, fines suspension and microcrystalline cellulose (MCC)] upon addition of uncharged and cationic polysaccharides. The adsorption and aggregation behaviors which take place in aqueous pulp suspensions are not only affected by the surface physico-chemical characteristics of cellulosic substrates but are also strongly influenced by the nature (charge type and degree of substitution) of the polymeric additives. It is evident that there is a complexation or aggregation of soluble and colloidal carbohydrates with the polysaccharide molecules that are then adsorbed on fines and /or retained on cellulosic fibers upon addition of the polyaccharides at very low dosages corresponding to those used in industrial practice. This corrrelates to the maximum fines retention, drainage and paper strength observed in industrial applications. The interactions that can take place among the various cellulosic components of pulp suspensions and polysaccharide additives are discussed in order to provide a better understanding of the intricate phenomena that occur in the wet end of paper manufacturing systems.

SALAGER J. L., ANTON R. E.,
Ionic Microemulsions,
in *Handbook of Microemulsions Science and Technology,* P. Kumar & K. Mittal Eds., Cap. 8. p. 247-280, Marcel Dekker New York (1999)
ABSTRACT: This is an advanced self-study text on microemulsion formulation in practice, which covers examples on ionic systems only, but whose scope extends to all cases. It starts with a discussion on what is often asked by graduate students and rooky researchers, i. e., what should be called micro, mini and macro emulsion and why. The Winsor's R ratio fundamentals and the formulation scan experimental techniques are reviewed next, and examples are provided on typical surfactant-oil-water systems. The following two sections deal with the formulation and microemulson attainment with pH-dependent systems and anionic-cationic surfactant mixtures, two cases for which very little information is found in the literature.

CARNAHAN N., SALAGER J. L., ANTON R. E., DAVILA A.,
Properties of Resins Extracted from Boscan Crude Oil and Their Effect on Stability of Asphaltenes in Boscan and Hamaca Crude Oils,
Energy and Fuel **13** (2) 309-314 (1999)
ABSTRACT: Experimental results confirm that resins isolated from Boscan crude oil have a stabilizing effect on asphaltenes in Hamaca crude oil and in Boscan crude oil. A simple experimental technique, referred to as the Filter Drop Spreading Method, was used to detect the onset of flocculation quite accurately for crude oil mixtures with and without additives.

MENDEZ Z., ANTON R. E., SALAGER J. L.,
Surfactant-oil-water Systems near the Affinity Inversion. Part XI: pH sensitive Emulsions containing Carboxylic Acids,
J. Dispersion Science & Technology **20** (3) 883-892 (1999)
ABSTRACT: Surfactant-oil-water systems in which the surface active substance is a mixture of carboxylic acid and its sodium salt (soap), exhibit emulsion property maps that are consistent with the phase behavior and the general emulsion phenomenology. However they present specific features such as an extended C+ multiple emulsion region and a skinked A+ W/O emulsion zone. In this case the aqueous phase pH drives the relative hydrophilicity of the acid/salt mixture at interface and plays the role of the most sensitive formulation variable. Systems contain C10 to 14 carboxylic acid, NaCl brine and a light distillation cut, and alcohols.

BURGUERA J. L., QUINTANA I. A., SALAGER J. L., BURGUERA M., RONDON C., CARRERO P., ANTON R. E., PETIT de PEÑA Y.,
The Use of Emulsions for the Determination of Methylmercury and Inorganic Mercury in Fish-egg Oil by Cold Vapor Generation in a Flow Injection System with Atomic Absorption Spectrometric Detection,
The Analyst **124**, 593-599 (1999)
ABSTRACT: An on-line time based injection system used in conjunction with cold vapor generation atomic absorption spectrometry and microwave aided oxidation with potassium persulfate has been developed for the determination of different mercury species in fish-egg oil samples. A three-phase surfactant-oil-water emulsion produced an advantageous flow when a peristaltic pump was used to introduce the highly viscous sample into the system. The optimum proportion of the oil-water mixture ratio was 2:3 v/v with Tween 20 surfactant concentration in

the emulsion of 0.008% v/v. Inorganic mercury was determined after reduction with sodium borohydride while total mercury was determined after an oxidation step with persulfate prior to the reduction step to elementary mercury with the same reducing agent. The difference between total and inorganic mercury determined the organomercury content in samples. A linear calibration graph was obtained in the range 0.1 - 20 microgram/liter of Hg2+ by injecting 0.7 ml sample. The detection limits based on 3 sigma of blank signals were 0.11 and 0.12 microgram/liter for total and inorganic mercury, respectively. The relative standard deviation of ten independent measurements were 2.8 and2.2 % for 10 microgram/liter and 8.8 and 9.0% for 0.1 microgram/liter amounts of total and inorganic mercury, respectively. The recoveries of 0.3, 0.6 and 8 microgram/liter of inorganic and organic mercury added to fish-egg oil samples ranged from 93 to 94% and from 100 to 106%, respectively. Good agreement with those values obtained for total mercury content in real samples by electrothermal atomic absorption spectrometry was also attained. Differences between mean values were < 7%. With the proposed procedure, 22 proteopterous catfish-egg oil samples from the Northwestern coast of Venezuela were measured; while organic mercury lay in the range 2.0 to 3.3. microgram/liter, inorganic mercury was not detected.

SALAGER J. L., ANDEREZ J. M., FORGIARINI A.,
Les Mousses - Influence de la formulation physico-chimique,
Actualité Chimique. **April 1999**, 10-21 (1999)
ABSTRACT: In the three steps that span a foam life, there are numerous phenomena which can stabilize it, most of them involving surfactants or other additives, which are dealt with as formulation factors. It is the case of Gibbs elasticity, capillary suction and several mechanisms that delay the drainage of the thin film. Foaming agents can influence in two ways, referred to as efficiency and effectivity. The first criterion corresponds to the smallest amount of surfactant that is able to produce the maximum foamability resulting from the conflict between Gibbs and Marangoni effects. It is often identical to the critical micelle concentration, a well known concept in colloid chemistry. The second criterion deals with the magnitude of the maximum effect, particularly the amount of produced foam in a standardized experiment, often referred to a foamability. After showing that these two criteria are independent from each other, the factors which are susceptible of increasing the affectivity, i. e. the foamability, are analyzed: low tension, higher adsorption density, better interactions between adsorbed molecules, interbubble repulsion, phenomena which could delay the film drainage. The most typical cases are analyzed. Anionic versus nonionic surfactants, effect of the surfactant molecular structure, shape factor, counter-ion type. Foam boosting effects are discussed next as due to the interaction of nonionic additives (fatty alcohol, acids, amides and others), and ionic species. The effect of electrolyte concentration is shown to be favorable or not, depending on the case. Finally the effect of polymer molecules either adsorbed or in solution, is dealt with, as well as the related association phenomena. The conclusion is that many effects are understood on an independent basis, but that their combination is often a risky business for the foam formulator, much less secure than in the case of emulsions.

BULLON J., CARDENAS A., CASTRO D.,
Aplicaciones de las membranas en la industria papelera, oral presentation,
XI Congreso Internacional ACOTEPAC, Medellín, Colombia June 2-4, 1999

FILLOUS L., CARDENAS A., ROUVIERE J., SALAGER J. L.,
Interfacial Mass Transfer versus Formulation in Multiple Phase Anionic Surfactant-Oil-Water Systems,
J. Surfactants & Detergents, **2** (3) 303-307 (1999)
ABSTRACT: Mass transfer through a liquid membrane is studied in a macroscopic set up that allows to estimate the resistance to interface crossing. It is found that the interfacial transfer is associated with the phase behavior and physicochemical formulation of the surfactant-oil-water system. The resistance to interfacial mass transfer closely follows the variation of the interfacial tension, i. e., it is minimum at optimum formulation so-called Winsor III phase behavior system.

ROJAS O.,
Mecanismos de la retención en la fabricación de papel,
oral presentation, *XI Congreso Internacional ACOTEPAC,* Medellín, Colombia June 2-4, 1999
ABSTRACT: La retención y el drenaje en la máquina papelera son aspectos fundamentales de la química del lado húmedo, tal como se observa de la trascendencia que tienen sobre el producto final los cambios en la formulación de la suspensión fibrosa (incluyendo la fracción celulósica, cargas y rellenos, y aditivos poliméricos). A pesar de la importancia de los fenómenos involucrados no se dispone de bases científico-técnicas que permitan predecir el comportamiento de un sistema o explicar los efectos observados a nivel práctico. En este trabajo se presenta un estudio realizado en sistemas relevantes a la fabricación del papel a los fines de dilucidar los mecanismos de la retención de finos, fibras, cargas y aditivos químicos durante el proceso de fabricación. Se discuten fenómenos como la adsorción y las interacciones que se originan después de la adición de polímeros a suspensiones fibrosas en términos de la cantidad adsorbida y la configuración de la macromolécula en la superficie. Se consideran diferentes substratos, tanto fibras celulósicas así como sistemas modelo tales como celulosa regenerada Langmuir-Blodgett. Así mismo se estudia la adsorción sobre superficies de cargas minerales tales como sílica y mica. Se evalúa el efecto de la naturaleza del polímero, densidad de carga eléctrica y peso molecular, sobre la adsorción mediante técnicas como elipsometría, espectroscopía de rayos X y microscopía de fuerza atómica. Los resultados indican la importancia de los efectos estéricos y electrostáticos en los mecanismos de adsorción. Finalmente, se examinan las consecuencias de la naturaleza de los aditivos utilizados y el ambiente físico-químico de la suspensión fibrosa en términos del proceso de retención en la máquina papelera.

FRÖBERG J., ROJAS O. J., & CLAESSON P.M.,
Surfaces Forces and Measuring Techniques,
Int. J. Mineral Process **56,** 1-30 (1999).

SING A., GRACIAA A., LACHAISE J., BROCHETTE P., SALAGER J. L.,
Interactions and Coalescence of Nanodroplets in Translucent O/W Emulsions,
Colloids and Surfaces A: Physicochemical and Engineering Aspects **152,** 31-39 (1999).
ABSTRACT: A thermal protocol has allowed us to produce translucent O/W emulsions composed of nanodroplets. By means of a static scattering analysis, we show that the interaction potential existing between nanodroplets is practically a hard sphere interaction potential. Dynamic light scattering measurements bring us to study the styeric effect induced by the surfactant molecules which are adsorbed at the water/oil interface. We confirm that nanodroplet dynamic coalescence rates are slowed down when the surfactant molecular weight is high.

SALAGER J. L., ANTON R. E., BRACHO C. L., BRICEÑO M. I., PEÑA A., RONDON M., SALAGER S.,
Attainment of Emulsion Properties on Design - A Typical Case of Formulation Engineering,
oral presentation, *2nd European Congress in Chemical Engineering,* Montpellier France, Oct. 1999. Published in *Récents Progrès en Génie des Procédés,* Vol. **13** (1999) N° 64, pag. 133-140.
ABSTRACT: Emulsion properties depend upon the combined effects of physico-chemical formulation, composition, and stirring features used during the emulsification protocol. It is shown that aording to the curently available know-how, the emulsification process characteristics can be translated into process design and engineering information. Two typical examples ar discussed.

BRICEÑO M. I., PEREZ M., RAMIREZ M., SALAGER J. L., ZAMBRANO N.,
Properties and Processing of High Internal Phase Ratio O/W Emulsions,
oral presentation, *2nd European Congress in Chemical Engineering,* Montpellier France, Oct. 1999. Published in *Récents Progrès en Génie des Procédés,* Vol. **13** (1999) N° 64, pag. 303-309.
ABSTRACT: A systematic approach for the preparation of HIPR emulsions is presented. The link between formulation, composition, mixing and the required properties is discussed. It is shown that emulsion properties may be altered at will by a proper control of internal phase content, formulation and droplet size distribution, among other variables.

BULLON J., NEGREL J. L., BELLEVILLE M. P., RIOS G., SALAGER J. L.,
Relation between End Use Separation Properties and Substrate Characteristics for New Proteinic Membranes,
oral presentation, *2nd European Congress in Chemical Engineering,* Montpellier France, Oct. 1999. Published in *Récents Progrès en Génie des Procédés,* Vol. **13** (1999) N° 64, pag. 449-456.
ABSTRACT: A new nanofiltration/low ultafiltration membrane was prepared by tangential filtration of protein solutions on macroporous ceramic supports. A unique feature of these membranes is their ability to work under mild conditions (pressure drop and tangent velocity). Moreover, they are biocompatible and may be easily regenerated. All these characteristics make them very good for concentration and purification of foodstuff, biological and pharmaceutical solutions.

SCORZZA C., BAULT P., GOETHALS G., MARTIN P., MIÑANA-PEREZ M., SALAGER J. L., VILLA P.,
New Amphiphilic Polypropileneglycol Derivatives with Carbohydrate Polar Head,
oral presentation, *24º Congreso anual del Comite Español de la Detergencia,* Barcelona Spain, May 5-7, 1999.

QUINTANA I., BURGUERA J. L., SALAGER J. L., BURGUERA M., RONDON C., CARRERO P., ANTON de SALAGER R.,
Uso de surfactantes para la determinación y especiación de mercurio en aceite de huevas de pescado,
Revista Sociedad Venezolana Química **22** (1), 17-21 (1999).

ABSTRACT: Se presenta un procedimiento analítico para espaciar mercurio en aceite de huevo depescado utilizando surfactantes para aumentar la fluidez en el sistema de inyección. Se optimizeo la formulación de la emulsión aceite/agua usando un surfactante noiónico de tipo ester de sorbitan etoxilado. Las determinaciones de mercurio inorgánico y orgánico se realizaron por espectrometría de absorción atómica con vapores fríos, optimizando los parámetros operacionales y evaluando las características analíticas. Para ambas especies de mercurio se llegó a un limite de detección del orden de 1 microgramo por litro. Una muestra típica de aceite de huevo de pescado contiene algo más que 2 microgramo por litro de mercurio total, esencialmente orgánico.

GOETHALS G., FERNANDEZ A., GODE A., MARTIN P., MIÑANA M., SCORZA C., VILLA P.,
Spacer arm influence on glucido-amphiphilic compound properties,
oral presentation, *III International Meeting of the Portuguese Carbohydrate Chemistry Group and I Iberian Carbohydrate Meeting,* Aveiro, Portugal, Sept. 19-23, 1999.
*ABSTRACT:*We prepared glucidoamphiphile derivatives from D-glucose, D-galactose and xylitol, in which the glucidic moiety hydrophobic alkyl are separated by spacer arm E (E=glyceryl, $(OEt)_2$-α-polypropyleneglycyl and butyloxy). Their amphiphile characteristics are compared to those of the corresponding analogs 3-O-alkyl-D-glucopyranoses, 6-O-alkyl-D-galactopyranoses and 1-O-alkyl-D-xylitols. We discussed the spacer arm influence on hydrophobic lipophilic balance (HLB), critical micellar concentration (CMC), water solubility (S_w) and phase transition temperatures of thermotropic and lyotropic mesophases.

FORGIARINI A., ESQUENA J., GONZALEZ C., SOLANS C.,
Influencia del tipo de fases y del método de emulsificación en el tamaño de gota y propiedades de emulsiones,
Jornadas Comite Español Detergencia, **29**, 73-84 (1999).
ABSTRACT: Se estudia la relación existente entre el tipo de fases presentes durante el proceso de emulsificación, el orden de adición de los componentes y la distribución de tamaño de gota de las emulsiones. Se estudió el comportamiento de fase del sistema agua/Brij-30/decano para obtener emulsiones O/W a 25°C. Se emulsificaron los sistemas según dos métodos: (A) adición del componente oleoso a una dispersión de agua y tensioactivo. (B) adición de agua a una solución del componente oleoso y tensioactivo. Las distribuciones de tamaño de las gotas de las emulsiones fueron determinadas por métodos de dispersión y difracción de luz laser, asi como por microscopía. Las emulsiones obtenidas por el método A son mas polidispersas que las obtenidas por el método B. Además, con el método B se obtuvieron nanoemulsiones. Los resultados obtenidos se han interpretado de acuerdo a los cambios en la curvatura natural del tensioactivo durante el proceso de emulsificación.

FORGIARINI A., ESQUENA J., GONZÁLEZ C., ALVAREZ N., SOLANS C.
Estudio de la influencia del tipo de fases en el comportamiento reológico de emulsiones,
in *Coloides e Interfases. Estado Líquido*. De las Nieves, F.; Fernández, A. Eds. Universidad de Almería, Vol 16, pp 441-450 (1999).

BULLON J., CARDENAS A.,
Las Membranas en la Industria. Nuevas Tecnologías,
Latin American Papermaker, **7** (5), 27-29 (1999).
ABSTRACT: En la producción de papel se consume una gran cantidad de agua y se produce un volumen de efluentes muy alto. Estos efluentes deben ser tratados antes de ser desechados al medio ambiente debido a que son altamente contaminantes. Tienen generalmente un alto pH, una alta demanda química y bioquímica de oxigeno, color y en algunos casos tienen cantidad importante de compuestos de azufre y derivados del cloro. Existen varias alternativas para el tratamiento de efluentes papeleros, como evaporación y calcinado, tratamientos de flotación, tratamientos biológicos y fisico-químicos (floculación, etc.) y filtración con membranas. Esta última tecnología es prometedora ya que permite separar compuestos de valor industrial, como ligninas (lignosulfonatos que se utilizan en lodos de perforación, por ejemplo). Adicionalmente, la filtración con membranas es de interés por su bajo consumo de energía (no hay cambio de fase en el proceso de separación) su fácil diseño y su instalación no requiere de modificaciones importantes en las plantas existentes. La gran cantidad de diferentes tipos de membranas, permite escoger la que mejor se adapta a las condiciones de operación. Las membranas, pueden ser utilizadas también en el tratamiento de aguas de calderas y en la recuperación de agua para su reutilización y cierre de circuitos. En este trabajo se presentan aplicaciones de membranas en la industria papelera, así como resultados de trabajos realizados en el Grupo de Membranas de la Universidad de los Andes aplicados al tratamiento de licores negros. Estos licores fueron tratados con membranas minerales de microfiltración, ultrafiltración y nanofiltración, las cuales representan la última generación de membranas producidas en el mercado. Los resultados indican que es posible separar las ligninas y reducir el color. Adicionalmente, se presentan resultados de concentración de soda por medio de electrodíalisis.