

## MEMBRANE DISTILLATION INSTEAD OF EVAPORATION FOR CONCENTRATION OF FRUIT JUICES

**O.A. Shapar, G.L. Ryabtsev**

*National Technical University of Ukraine «Kiev Polytechnic Institute», Ukraine*

*Represented by a Member of the Editorial Board Professor N.Z. Gatapova*

The problems of steady development of economy have been in the center of attention in many countries including Ukraine. The solution to this question is related to active introduction of molecular and nanotechnology in the industry. They must replace outdated powerful and ecologically dangerous productions developed in Ukraine in Soviet time, and make our country one of the leaders in the world division of labor. Membrane distillation belongs to such advanced technologies.

Membrane distillation is a process of membrane separation of the liquid systems on molecular level, which involves evaporation of volatile component solution through the pores of polymeric membrane and condensation of it on the opposite side of this membrane. The term 'contact membrane distillation' is applied to processes which have the following characteristics: the membrane must be porous and not moistened; there must be no capillary condensation within the membrane pores; only vapour should be transferred through the membrane pores; both sides of membrane must be in direct contact with the liquid; for each component the driving force of the mass transfer is the partial pressure gradient in the vapour phase [1].

Ukraine occupies one of the main places in Europe in production of concentrated juices because of considerable supplies of own raw material. Due to raw material supplies an export of the concentrated apple juice from Ukraine is about 4 % world's export. Today there are a few methods of concentration of fruit juices, but a lot of them have the substantial failings. For examples, a high level of power expenses on heating and evaporation of initial solution or probability of decomposition of the finished product. Therefore, the method of contact membrane distillation for the concentration of juices is offered.

The process of contact membrane distillation has many advantages, which compensate the lack of traditional processes of concentration. Firstly, the process takes place under atmospheric pressure and low temperatures. Secondly, membrane distillation provides a high degree of concentration [2].

A process of membrane distillation is new, however many options for its implementation already exist. In particular, The Department of Machines and Vehicles of Chemical and Petrochemical Productions of NTUU «Kyiv Polytechnical Institute» with Institute of Vine and Wine «Magarach» developed projects of membrane options UMD-50 and UMD-100 with membranes MFFK-3 intended for the concentration of fruit juices.

On the other hand, the process of membrane distillation has a few disadvantages. The biggest one is the low productivity of process (about 5–15 l/sqrm h). Considering this, it is very important to continue the experiments of membrane distillation aimed at the development of new effective options and highly productive membranes, because contact membrane distillation is the most perspective method of concentration of fruit juices.

## References

1. Bryk, M.T., Nigmatullin, R.R. Membrane distillation // Russian Chemical Reviews. – 1994. – № 63 (12). – P. 1047–1062.
2. Shapar, O.A. Membrane distillation as a method of cleaning of flow waters / O.A. Shapar, G.L. Ryabtsev // Proceedings of the III International Young scientists conference «Biodiversity. Ecology. Adaptation. Evolution». – Odessa : Pechatniy dom, 2007. – P. 291.

---

### **Мембранная дистилляция вместо выпаривания для концентрации фруктовых соков**

**О.А. Шапарь, Г.Л. Рябцев**

*Национальный технический университет Украины  
«Киевский политехнический институт», Украина*

---

### **Membrandistillation anstatt der Verdunstung der Konzentration von Fruchtsäfte**

---

### **Membrane de distillation dans le stade de l'évaporation et concentration du jus de fruit**

---