

Influence of aeration on zeolite suspension microfiltration

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The effects of air injection under various conditions on the experimental results were investigated on microfiltration apparatus. In the experiments zeolite from the area of Nizny Hrabovec was used. Different patterns of flow in the microfiltration system under changing conditions were monitored. The particular flows were photographed and evaluated.

If the particles in suspension are of larger dimensions than the membrane pores, the particles settle slowly and accumulate on the membrane surface and form a highly concentrated layer. Due to the formation of this layer the accumulation of solute at the membrane wall and thus sometimes irreversible clogging of the membrane occurs (Vera et al. 2000). The sedimentation of particles on the surface and in the pores of the membrane results in a reduction in the flow and growth of energy consumption. However, there is great potential to reduce this concentration polarization and fouling. At present, two-phase flow studies are of experimental nature and focus mainly on improving the conditions in filtration (Mikulášek et al. 2002). The injection of gas helps to reduce concentration polarization layer so that it improves the hydrodynamic conditions near the surface of the membrane. The results of the study suggest that the improvement of the flow should be achieved by providing appropriate conditions, using the multi-phase microfiltration, low liquid velocity, by mean speed of the gas injected (Qian et al. 2012).

The use of a two-phase flow is considered to be the preferred method to overcome the concen-

tration polarization. During the process gas is directly injected at a given pressure and speed into the feed (Bakalár 2013). Cui & Wright (1996) observed improvement in flow of up to 320% if used two-phase flow with gas injected into the suspension in their experiments.

Under normal circumstances gas-liquid two-phase vertical flow exhibits different flow patterns including dispersed bubble flow, slug-flow, churn flow, and annular flow as the gas to liquid ratio increases. Bubble flow occurs when the bubbles are significantly less than (e.g. < 60%) the tube or channel size. The bubble behaviour is similar to the bubbles in a stationary liquid. Slug-flow (also called plug-flow) occurs when the gas flows as large bullet-shaped bubbles approaching the diameter of the tube or channel size (Cui & Wright 1996, Vera et al. 2000).

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