



The figure shows two types of fritted emitter tips that we made for comparison. For traditional fritted tip, the particles are fully filled at the top of the emitter, which raises an issue for tip clogging of very tiny spaces formed by particles during/after ESI experiments due to analyte drying. We developed new format of fritted emitter tips with evacuation of the filled particles and formation of an empty space at the top of the emitter, which greatly reduces possibility of tip clogging. Additionally, the empty space at the orifice enables solution free sprayed without potential particle surface adsorption to analytes eluted, benefiting analysis sensitivity. The void volume of the whole evacuated frit space roughly is one ten thousandth of a nanoLC column and its influence on separation efficiency is negligible, especially under mobile phase gradient conditions.