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四种典型抗生素在饮用水源中不同粒径颗粒上的竞争吸附研究

**Competitive adsorption of four typical antibiotics on the different diameter particles in the drinking water resource**关键词: [水体颗粒物](#) [抗生素](#) [竞争吸附](#) [饮用水](#)基金项目: [国家水体污染控制与治理科技重大专项\(No.2014ZX07203-009-02\)](#)

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摘要: 水体中的颗粒物作为载体,会吸附重金属、抗生素等污染物质,在饮用水传统处理工艺下难以有效去除,成为饮用水中的一大安全隐患.本文利用微波萃取(MAE)和高效液相色谱与质谱联用(HPLC-MS/MS)方法分别对颗粒物上吸附的抗生素进行了前处理和测定,分析了饮用水源水中的颗粒物对4种典型抗生素的竞争吸附特性.研究表明,水体颗粒物吸附单一抗生素达到吸附平衡时,小颗粒和大颗粒上的吸附位点均未达到饱和.抗生素的结构对其在颗粒物上的吸附有重要影响,4种抗生素的两两竞争吸附结果显示,罗红霉素(ROX)、青霉素G(PG)的竞争能力最强,甲氧苄啶(TMP)次之,萘啶酸(NAL)的竞争能力最弱.

**Abstract:** Small particles exist widely in natural waters. They absorb many contaminants, such as heavy metals, antibiotics, *et al.* They may become their carriers and are difficult to remove from the water by the traditional drinking water treatment technology. Four kinds of typical antibiotics, Nalidixic acid (NAL), Penicillin G (PG), Roxithromycin (ROX), and Trimethoprim (TMP), were selected to study their competitive adsorption behavior on the surface of the particles in the drinking water resource. Environmental scanning electron microscopy (ESTM) and energy dispersive spectroscopy (EDS) were used to analyze element composition of particles. Microwave extraction method (MAE) was used to concentrate antibiotics absorbed by the particles. high performance liquid chromatography tandem mass spectrometry (HPLC-MS/MS) was developed for simultaneous determination of the four antibiotics. The structure of the antibiotics influenced greatly on particle adsorption capacity to antibiotics. According to the adsorption equilibrium, when one kind of antibiotic existed in the water, the adsorption sites on both of the small and large particles were not saturated. The result of the binary component competitive adsorption has indicated that the particles' adsorption ability of PG and ROX were the strongest, then was TMP, and NAL was the last.

**Key words:** [water particles](#) [antibiotics](#) [competitive adsorption](#) [drinking water](#)

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