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[首页](#)[稿约信息](#)[编者论坛](#)[编委会](#)[关于本刊](#)[订购本刊](#)[下载中心](#)孙培德,张柯柯,方婧,金光.土壤颗粒对纳米TiO₂悬浮稳定性作用机制的实验研究[J].环境科学学报,2015,35(3):844-854土壤颗粒对纳米TiO₂悬浮稳定性作用机制的实验研究**Experimental study on the effecting mechanisms of soil particles on the stability of TiO₂ nanoparticles**关键词: [土壤](#) [纳米二氧化钛](#) [表面活性剂](#) [稳定性](#)基金项目: [国家自然科学基金\(No.21007057.21337004\)](#)

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摘要: 在不含表面活性剂和含有表面活性剂两种条件下,研究了土壤颗粒对纳米TiO₂(*n*TiO₂)悬浮稳定性的影响.结果表明,土壤颗粒降低了*n*TiO₂在水相中的悬浮稳定性.当体系中不含表面活性剂时,*n*TiO₂在土壤大颗粒上的沉积是导致*n*TiO₂脱稳沉淀的主要原因.在含有表面活性剂的溶液中,土壤颗粒降低*n*TiO₂悬浮稳定性的作用变得更加明显了.一方面,表面活性剂加速了土壤颗粒本身的沉降从而增强了*n*TiO₂在其中的沉降,另一方面,表面活性剂在土壤上的强烈吸附促进了表面活性剂-*n*TiO₂在土壤上的沉积.扫描电镜显示,*n*TiO₂不仅吸附在土壤大颗粒上,还会吸附在土壤小颗粒表面.3种表面活性剂中,十六烷基三甲基溴化铵(CTAB)悬浮的*n*TiO₂与土壤颗粒共沉淀现象最明显.除了土壤对CTAB的吸附作用之外,XDLVO/DLVO能量计算显示CTAB体系中土壤颗粒与*n*TiO₂之间存在显著第二极小值,表明*n*TiO₂能够在第二极小值位置与土壤颗粒结合,从而与土壤颗粒一起快速沉淀.

Abstract: The effect of soil particles on the stability of TiO₂ nanoparticles (*n*TiO₂) both in the absence and in the presence of surfactants was systematically investigated. Results showed that soil particles significantly destabilize *n*TiO₂ in aqueous. In the absence of surfactants, the adsorption of *n*TiO₂ on large soil particles was mainly responsible for the destabilization and sedimentation of *n*TiO₂. In the presence of surfactants, the destabilization of *n*TiO₂ by soil particles was significantly enhanced. On the one hand, surfactants enhanced the sedimentation rate of soil which led to the enhanced destabilization of *n*TiO₂. On the other hand, the large adsorption of surfactants on soil was also responsible for the co-deposition of surfactant and *n*TiO₂ on soil. SEM showed *n*TiO₂ did not only adsorb onto large soil particles, but also onto the fine particles. Among the three surfactants, the co-precipitation of *n*TiO₂ with soil particles in cetyl trimethylammonium bromide (CTAB) is the most obvious. Besides the adsorption of surfactant on soil, XDLVO/DLVO energy calculation revealed a significant secondary minimum between soil particles and *n*TiO₂, where hetero-aggregation of *n*TiO₂ with soil would probably occur.

Key words: [soil particles](#) [titanium dioxide nanoparticles](#) [surfactant](#) [stability](#)

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