



Interaction between the Bacterium *Pseudomonas fluorescens* strain CHA0, its genetic derivatives and vermiculite: Effects on chemical, mineralogical and mechanical properties of vermiculite

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Using bacteria of the strain *Pseudomonas fluorescens* wild type CHA0 and its genetic derivative strains CHA77, CHA89, CHA400, CHA631 and CHA661 (which differ in one gene only) the changes in chemical, mineralogical and rheological properties of the clay mineral vermiculite affected by microbial activity were studied in order to test whether the individually different production of metabolites by the genetically engineered strains may alter the clay mineral vermiculite in distinct ways. With the novel strategy of working with living wild type bacteria, their genetic derivatives and clay, the following properties of the mineral altered by the various strains of *Pseudomonas fluorescens* were determined: grain size, X-Ray diffraction pattern, intercrystalline swelling with glycerol, layer charge, CEC, BET surface and uptake of trace elements. Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) was used to determine the changes in major, minor and trace elements of the clay vermiculite affected by microbial activity. Among all analyzed trace elements, Fe, Mn and Cu are the most interesting. Fe and Mn are taken up from the clay mineral by all bacterial strains whereas Cu is only removed from vermiculite by strains CHA0, CHA77, CHA400 and CHA661. The latter mentioned strains all produce the antibiotics 2,4-diacetylphloroglucinol and monoacetylphloroglucinol which can complex Cu efficiently. Therefore the alteration of only one gene of the bacteria is causing significant effects on the clay mineral.