The thermochemistry of macronutrients during fires and the effects on post-fire cycling

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Fire is a common and pervasive disturbance to most terrestrial ecosystems. By burning tremendous amounts of biomass and forming gases, aerosols, and solid residues deposited on the ground surface, as well as changing other ecosystem properties, fire not only immediately transforms carbon (C) and nutrient pools but, more importantly, has a lasting impact on the coupled cycling of C and nutrients. In this work, we first explored the thermochemistry of macronutrients during vegetation fires by characterizing the chemical speciation of several macronutrients in ash derived from simulated burning and vegetation fires using several spectroscopic techniques. Geochemical behaviors of the ash were evaluated by batch experiments that determines the dissolution of macronutrients and the effects of elemental speciation and solution chemistry. The results show the interplay between ecosystem types and fire conditions in controlling ash properties and the fate and transport macronutrient, which has important implications to evaluating the effects of fire on ecosystem nutrient status.