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Interaction of Aromatic Amines with Iron Oxides: Implications for Prebiotic Chemistry

Uma Shanker · Gurinder Singh · Kamaluddin

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Abstract The interaction of aromatic amines (aniline, p-chloroaniline, p-toludine and p-anisidine) with iron oxides (goethite, akaganeite and hematite) has been studied. Maximum uptake of amines was observed around pH 7. The adsorption data obtained at neutral pH were found to follow Langmuir adsorption. Anisidine was found to be a better adsorbate probably due to its higher basicity. In alkaline medium (pH>8), amines reacted on goethite and akaganeite to give colored products. Analysis of the products by GC–MS showed benzoquinone and azobenzene as the reaction products of aniline while *p*-anisidine afforded a dimer. IR analysis of the amine–iron oxide hydroxide adduct suggests that the surface acidity of iron oxide hydroxides is responsible for the interaction. The present study suggests that iron oxide hydroxides might have played a role in the stabilization of organic molecules through their surface activity and in prebiotic condensation reactions.

Keywords Aromatic amines · Interaction · Goethite · Akaganeite

Introduction

Iron oxides are present in almost all the different compartment of global system, including the pedosphere, biosphere, lithosphere, and hydrosphere (Cornell and Schwertmann 2003). The large surface area of goethite (57.40 m^2/g) and akaganeite (27.37 m^2/g), classify them as strong adsorbents for biomonomers and other species.

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U. Shanker (✉) · G. Singh
Department of Chemistry, Dr B R Ambedkar National Institute of Technology Jalandhar, Jalandhar 144011 Punjab, India
e-mail: umaorganic29@gmail.com

Kamaluddin
Department of Chemistry, Indian Institute of Technology Roorkee, Roorkee 247 667 Uttarakhand, India