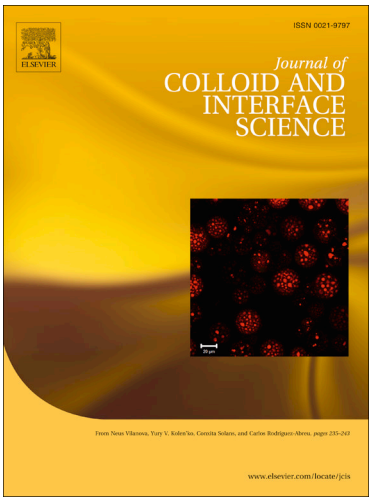

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Nanoaggregates of iron poly-oxo-clusters obtained by laser ablation in aqueous solution of phosphonates

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Abstract.

Laser ablation in liquid (LAL) emerged as a versatile technique for the synthesis of nanoparticles with various structures and compositions, although the control over products remains challenging in most cases. For instance, it is still difficult to drive the size of metal oxide crystalline domains down to the level of few atom clusters with LAL. Here we demonstrate that laser ablation of a bulk iron target in aqueous solution of phosphonates gives phosphonate-grafted iron oxo-clusters polymerized into nanoaggregates with Fe : ligand ratio of 2 : 1, instead of the usual nanocrystalline iron oxides. We attribute this result to the strong ability of phosphonate groups to bind iron oxide clusters and prevent their further growth into crystalline iron oxide. These laser generated poly-oxo-clusters are biocompatible and trackable by magnetic resonance imaging, providing interesting features for use in biological environments, such as nano-vehicles for iron administration. Besides, this method is promising for the generation of atom-scale metal-oxide clusters, which are ubiquitary in chemistry and of interest in biochemistry, catalysis, molecular magnetism and materials science.