The affinities of metal ions towards amino acids and *vice versa*: green and clean competitive milling

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With some exceptions, biologically relevant metal ions are predominantly coordinated by a small group of amino acids: the side chains of cysteine and methionine, histidine, glutamic and aspartic acid and their amides. The possibilities provided by these components are remarkable, from different coordination geometry to different chemical functions (even with a minor change in the surrounding composition).[1] The combination of neutral *vs*. charged, hydrophobic *vs*. hydrophilic, redox features, pH-sensitivity and other chemical properties coherently collaborate to provide unique metal binding sites capable to perform certain function.[2] On the other hand, many amino acid-metal complexes are embedded in various industrial processes and formulations.[3] During last decades, the body of structural information has grown up to a point where most of the amino acid-metal complexes are structurally characterized.[4] Interestingly, there are number of open gaps[5] that mostly arise from preparation and separation methods, while the biggest obstacle is structural characterization of powder samples and preparation of single crystals.

In that context, we are seeking green ways of exploring this chemical playground. In our recent studies of binding of environmentally relevant metal ions (copper, nickel, manganese, cobalt and zinc) with a selected set of amino acids (Asn, Gln, His, Trp, Met, Lys) we have found the environmentally friendly mechanochemical synthesis to be a good synthetic choice. The affinities of metal ions towards the amino acids and *vice versa*, were tested in diverse competitive milling experiments. Meticulous choice of reactants allowed high reaction yields followed by fast and simple isolation of desired products.

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