EXPLORATION OF THE CHEMICAL SPACE OF METAL BINDERS USING GENERATIVE TOPOGRAPHIC MAPPING

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Generative Topographic Mapping[1] (GTM) is a non-linear dimensionality-reduction technique widely used to visualize the data as projections onto 2-dimentional space. In chemistry, GTM maps can efficiently be used to visualize and analyze ensembles of chemical data (molecules or reactions) encoded by molecular descriptors.[2,3] On these maps, similar compounds are usually grouped together which helps to discover different chemotypes presented in the dataset. Structure-property relationships can be established using GTM *activity landscape* forming by an additional third coordinate which corresponds to the property. Landscape represents a smooth 3D surface where "active" compounds (with high property values) are localized in "hills" area, whereas "inactive" ones are situated in "valleys".[4] Mapping a new compound onto such landscape allows one to predict quantitatively its property.[4]

In this study, GTM was used to analyze a chemical space of known 3000 organic ligands (L) able to bind 50 different metal cations (M). Obtained GTM maps allowed us to detect zones of ligands selectivity and promiscuity with respect to certain metals. Activity landscapes built for stability constant log*K* of ML complexes in water allowed us perform quantitative predictions of binding profiles of studied molecules.

References

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