

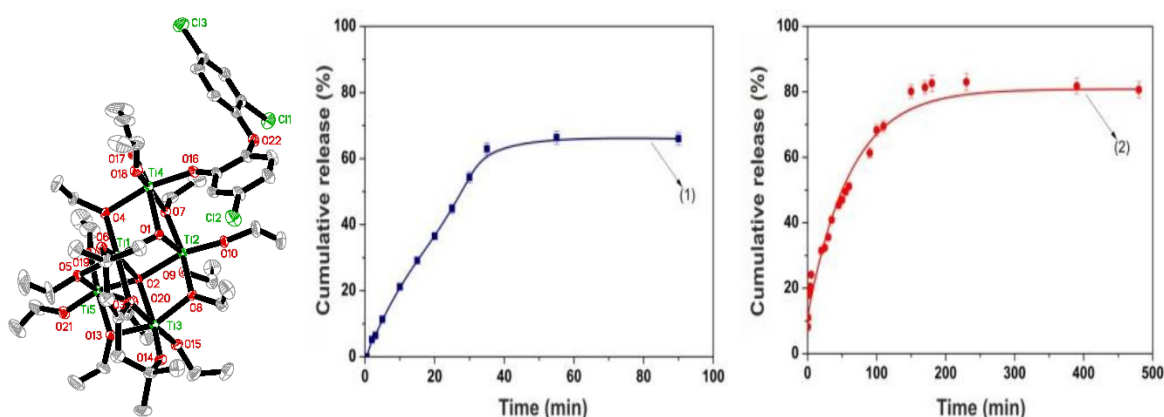
## METAL OXIDE SOL-GEL MATERIALS AS DRUG DELIVERY VEHICLES AND COMPONENTS OF TISSUE SCAFFOLDS: FROM (OXO)ALKOXIDE PAPERBAG MODELS TO APPLICATIONS

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### ABSTRACT:

Metal oxide sol-gel process is based on massive nucleation, resulting in primary particles 2-5 nm in size, featuring well-ordered and often crystalline cores and amorphous shells, terminated by organic ligands or electrically charged species.<sup>1</sup> Gelation is associated with aggregation of the primary particles with formation of closed mesoporous structures. Tailoring of the surface layer in primary particles via careful choice of ligands opens for both keeping large surface area and controlling their reactivity. The ability to bind and retain ligands can be understood through studies of intermediate products of hydrolysis, bearing the target ligands. These species resemble polyoxometallate compounds and are paperbags in their nature, i.e. oligonuclear complexes without metal-metal bonding. This contribution will present results of studies of a large number of metal oxo-alkoxide paperbag complexes with model phenoxide<sup>2</sup> and alkyl phosphonate ligands,<sup>3</sup> shedding light on possibility of controlled release of, in particular, antibiotic medicines for improved wound healing.<sup>4</sup> A special focus will be made on metal oxide nanoparticle interaction with peptide and protein molecules,<sup>5</sup> demonstrating their ability of specific binding, permitting to apply tailored nanomaterials as potential components of tissue scaffolds improving the healing process.



**Figure 1 :** Molecular structure of the  $\text{Ti}_5(\mu_3\text{-O})_2(\mu_2\text{-OEt})_5(\mu\text{-OEt})_8(\text{C}_9\text{H}_{16}\text{O}_3)(\text{C}_{12}\text{H}_6\text{Cl}_3\text{O}_2)$  paperbag, and cumulative release (%) of triclosan (TR =  $\text{C}_{12}\text{H}_6\text{Cl}_3\text{O}_2$ ) from nano cellulose (NC) impregnated with TR (left) and NC-TiO<sub>2</sub> composite modified with TR (right).

### References

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