Silsesquioxanes as Multifunctional Ligands in Coordination Chemistry and Nano-Building Blocks for Hybrid Materials

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Our scientific progress in many areas is dependent on the solution of crucial materials problems. Now we can construct materials in which the best properties of two or more constituents will be used to advantage. Dr. W. O. Baker, former vice president of research at Bell Labs, summed up the significance of materials in our present age this way: *"Materials as never before must be the means through which man realizes his dreams of well-being on earth, or, failing that, liberation into space."*

The submitted project stems from an about decade of experience and our recent breaking through discoveries in the field of silicon-based chemistry. Our up to date interests in this field were directed not only into synthetic aspects but also applications and selected properties of developed materials. **In this project, we are going to focus our scientific curiosity on two specific groups of silsesquioxanes – polyhedral oligomeric silsesquioxanes (POSS) and double-decker silsesquioxanes (DDSQ) which may play the role of a novel class of multidentate ligands in coordination chemistry but also attractive nano-building blocks for new organic-inorganic hybrid materials with tunable and outstanding properties**.

Since many of these materials are derived from species that possess complementary structural and functional properties, their assembly into a single structure could result in **interesting intramolecular interactions and introduce new opportunities to design novel nano-building blocks and, in general, materials for targeted applications**. Organosilicon compounds have found applications in diverse areas such as optoelectronic systems, attractive dopants for polymers and composites, potential biomaterials for tissue engineering, highly efficient adsorbents, sensitive hosts for anionic guests, thin films, sensors, *etc.* As a result of their broad range of applications, there exists a rich source of commercially available precursors and a plethora of detailed literature on their properties. **This important area of exploration further gives impetus to explore these structurally and functionally diverse blocks as material platforms for fascinating coordination entities synthesis**.