Where paramagnetic centres are involved, ranging from Transition Metal Ions (TMI) to defects and molecular radical species, EPR spectroscopy is the technique of choice. Ti(III), Zr(III), V(IV), Cr(I), Cr(III), Cr(V), Mn(II), Fe(III), Co(II), Ni(I), Cu(II) are all prominent, EPR active, actors in homogeneous and heterogeneous catalysis.

Defect states, surface morphology and surface composition have an important role in determining the reactivity of oxide materials (TiO$_2$, ZrO$_2$, CeO$_2$). EPR techniques are employed in the characterization of these materials with the aim of achieving an atomic scale understanding of their properties. Particular attention is devoted to the presence of point defects, to the formation of mixed systems and to the photochemical phenomena of charge separation under various types of illumination.

Metal oxides are prepared via different synthesis ways: sol-gel, hydrothermal, MW assisted, wet impregnation. Synthesized materials are fully characterized via XRD, SEM, TEM BET, UV Vis and EPR spectroscopy that is used as preliminary test for photoactivity.