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MID and FAR-IR spectroscopy of rare earth ions

The mid-infrared region (MID-IR) is an extremely interesting region to study roto-vibrational transitions of molecules. Possible applications comprise material analysis, quality control, dynamic measurements, environmental and medical monitoring applications, forensic testing, analysis of art objects. Available sources in this region (such as quantum cascade lasers and lead-salt diode lasers) need cryogenic operation and/or suffer from strong limitations as for output peak power, tunability and beam quality. A completely different approach for MID-IR quantum light generation is the use of doped insulating crystals as active media. Transition metals like Cr²⁺ and Fe²⁺ have already been used as dopant agents for broadly tunable pulsed emission, but the use of rare earths can widen the emission wavelength regions available and could permit cw emission with excellent beam quality. A key role, in this case is

played by the host crystal which must have low phonon energy to prevent non-radiative quenching of the emission at this wavelength. For this reason, new types of host crystals must be investigated and their growth optimized. A brief review of the state of the art and recent developments in this field will be given.

Speaker Biography

Alessandra Toncelli has obtained her PhD in Physics in 1998 at the University of Pisa. Since 2017, she is an associate professor at the Physics Department of Pisa. Her scientific interest was initially aimed to the growth and spectroscopy of crystalline materials for photonic applications in visible and near infrared regions. In particular, she studied and characterized the optical and spectroscopic properties of oxide and fluoride crystals with rare earths for laser applications. She has published more than 160 articles on International journals. She currently holds an h-index of 41 both in Scopus and in ISI web of knowledge.

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