CONCLUSIONS

In this work the experimental activities and the physical and numerical modelling for the result interpretations are carried out in low pressure non equilibrium argon plasmas. The analysis is devoted to fully ionized (MPD case) and weakly ionized plasmas (RF discharges). The optical measurements are integrated with other experimental techniques and with the developing of a theoretical model. The emitted radiation on MPD plasma plume is studied by means of an OMA system with a CCD camera, by which the estimations of some plasma parameters (electron density, population temperature and ionization degree) is carried out. These results are compared with a collisional-radiative model developed for the singly ionized argon system. In this model the energy distribution of the free electrons is calculated by solving the Boltzmann equation. An agreement between the calculated and the measured distribution of population over the levels is obtained. Moreover, the calculated energy distribution shows deviations from the Maxwellian distribution. A CCD fast shutter camera is utilized in order to have information on the occurrence of structures in the plasma. A “clot” during the start-up phase of the current and several striations are observed.

The particle formation at different gas temperatures in argon-silane RF discharge is analyzed by plasma emission, laser light scattering and electrical measurements. The various formation phases of particles cause variations in the electrical parameters as well as the optical parameters. The

previously observed delay in particle nucleation with increasing temperature is confirmed. Moreover, all subsequent phases in the particle formation process are delayed as well with increasing temperature. The overall correlation between electrical, emission and scattering data shows that particle growth affects various plasma properties. Consequently, to study the full particle growth process several diagnostics are necessary. On the other hand, if one is only interested in a single phase, for example in an industrial environment, a single, simple and reliable method is most likely available.

Concluding, the different diagnostic methods applied give slightly different information, which taken together give a complete picture of the processes occurring in the investigated plasmas.