



Canadian Association  
of Physicists

Association canadienne  
des physiciens et physiciennes

Contribution ID: 461

Type: Oral (Non-Student) / Orale (non-étudiant(e))

## Mode-coupling instability of two-dimensional complex plasma crystals in asymmetric capacitively-coupled radio-frequency discharges

*Tuesday, June 8, 2021 3:35 PM (15 minutes)*

The dependence of the mode-coupling instability threshold in two-dimensional complex plasma crystals is studied. It is shown that for a given microparticle suspension at a given discharge power there exist two thresholds in pressure. Above a specific pressure  $p_{\max}$ , the monolayer is always in the crystal phase. Below a specific pressure  $p_{\min}$ , the crystalline monolayer undergoes the mode-coupling instability and the monolayer is in the fluid phase. In between  $p_{\min}$  and  $p_{\max}$ , the crystal will be in the fluid phase when increasing the pressure from below  $p_{\min}$  until it reaches  $p_{\max}$  where it recrystallises, while it remains in the crystal phase when decreasing the pressure from above  $p_{\max}$  until it reaches  $p_{\min}$ . A simple auto-consistent sheath model can explain the melting threshold as a function of pressure and rf power due the changes of the sheath electric field and the microparticle charges leading to the crossing of the compressional in-plane phonon mode and the out-of plane phonon mode.

**Author:** COUEDEL, Lenaic (University of Saskatchewan)

**Co-authors:** Dr NOSENKO, Vladimir (Institut für Materialphysik im Weltraum, Deutsches Zentrum für Luft- und Raumfahrt (DLR)); Dr ZHDANOV, Sergey (Institut für Materialphysik im Weltraum, Deutsches Zentrum für Luft- und Raumfahrt (DLR) )

**Presenter:** COUEDEL, Lenaic (University of Saskatchewan)

**Session Classification:** TS-3 Plasma Physics Symposium (DPP) / Symposium de physique des plasmas (DPP)

**Track Classification:** Symposia Day (DPP) - Low temperature plasmas/Fusion plasmas (magnetic and inertial confinement)/ Laser plasmas/Basic plasmas