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On the breakup of nanoscale metalic rings melted via laser pulses JAVIER DIEZ, Instituto de Física Arroyo Seco, Universidad Nacional del Centro de la Provincia de Buenos Aires, Pinto 399, 7000, Tandil, LOU KONDIC, Department of Mathematical Sciences and Center for Applied Mathematics and Statistics, New Jersey Institute of Technology, Newark, NJ, YUEYING WU, JASON FOWLKES, PHILIP RACK, Dept. of Materials Science and Engineering, The University of Tennessee, Knoxville, TN 37996; The Oak Ridge National Laboratory, Oak Ridge, TN 37831 — We apply a hydrodynamic model based on lubrication approximation with the inclusion of van der Waals forces to study the instability and breakup of nanolithographically patterned copper rings. The initially solid metal is transformed into liquid phase via nanosecond pulsed laser heating above the melt threshold. We show that the resultant average distance between droplets can be correlated to the dewetting flow and instability growths that occur during the liquid lifetime of the melted copper rings. For rings with 13nm height, experimental data give a sudden change in the nanoparticle spacing relation with the ring width. This behavior is attributed to a transition from a Raleigh-Plateau instability to a thin film instability due to the competition between the cumulative transport and instability timescales. To explore the competition between instability mechanisms further, we carried out experiments with rings of height 7 nm. These results were recently published in Langmuir (26(14), 11972, 2010).

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