K11a Dust Formation and Emission in Pulsar-Driven Supernova Remnants

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We use a steady-state model to study the growth of dust grains in the ejecta of a pulsar-powered supernova, and examine the effects of non-thermal ionization of the ejecta gas and sublimation of smaller grains on the dust formation timescale, average size, and re-emission from larger grains due to PWN emission. We consider dust compositions based on those expected for a variety of progenitors of Type Ic, Ib, and IIb supernovae, including SLSNe, and calculate the properties of C, $MgSiO_3$, and MgO grains in their ejecta. We find that dust formation can be accelerated if the pulsar has a short spin-down time, or delayed if considerable energy injection lasts over the course of a few months. We find that the dust size decreases when the effect of the pulsar is considerable, and the detectability of the emission sensitively depends on the assumed PWN spectrum. We also discuss caveats of this model and the implications for several historical supernovae, including SN1987A.