RADIO INTERFEROMETRIC DETECTION OF TiO AND TiO_2 IN VY CANIS MAJORIS: "SEEDS" OF INORGANIC DUST FORMATION

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Circumstellar envelopes around late-type stars harbour a rich variety of molecular gas and copious amounts of dust, originating from the mass-loss of the central star during the asymptotic giant branch (AGB) or the red supergiant phase. The formation of dust in these objects, in particular the first nucleation stages out of gas phase molecules, is still poorly understood. Here we report the first detection of pure rotational transitions of the two simplest titanium oxides, TiO and TiO_2, towards the oxygen-rich red supergiant VY Canis Majoris (VY CMa). This actually represents the first secure identification of TiO_2 in space. Observations of several rotational emission lines of both species with the Submillimeter Array (SMA) in the 345 GHz-band and with the IRAM Plateau de Bure Interferometer (PdBI) around 220 GHz confirm the presence of these refractory species in the cool ($<$1000 K) circumstellar envelope in a region several times the size of the dust formation zone. The role of Ti oxides as "seeds" of inorganic dust formation in oxygen-rich circumstellar envelopes will be discussed in view of the present observations.