

Silicate Crystallinity and Mass Loss Rate of Oxygen-Rich Evolved Stars

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For decades ever since the early detection in the 1990s of the emission spectral features of crystalline silicates in oxygen-rich evolved stars, there is a long-standing debate on whether the crystallinity of the silicate dust correlates with the stellar mass loss rate. To investigate the relation between silicate crystallinity and mass loss rate of evolved stars, we carry out a detailed analysis of 28 nearby oxygen-rich stars. We derive the mass loss rates of these sources by modeling their spectral energy distributions from the optical to the far infrared. The silicate crystallinity is expressed by the flux ratios of the emission features of crystalline silicates to that of amorphous silicates, which has the advantage over generally used mass ratio by avoiding the uncertain dust temperature. The result shows no apparent correlation of silicate crystallinity and mass loss rate. In addition, a search for SiO maser emission is performed to the stars with spectral features of crystalline silicate. The SiO maser power is found to correlate with the dust mass while not correlated with silicate crystallinity. This fact indirectly supports that silicate mass loss rate is not correlated with mass loss rate.