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Cryogenic spice grinding: A boon to spice processing

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Spices are most important constituents of food and cuisines especially in India. These are used not only in households, but also in hotels, restaurants, eateries and food processing industries. The fat content of spices poses problems due to temperature rise to the extent of 42-95°C and sieve clogging takes place during grinding. Due to this temperature rise, spices lose a significant fraction of their volatile oil or flavoring components. The loss of volatile oil can be significantly reduced by cooling the spices before feeding to the grinder and also maintaining the ultra-low temperature in the grinding zone. In cryogenic grinding, liquid nitrogen, having boiling point of -195.6°C, provides the refrigeration needed to pre-cool the spices and maintain the desired low temperature by absorbing the heat generated during the grinding operation. In addition to maintaining the low temperature, vaporization of the liquid nitrogen to the gaseous state, in fact, creates an inert and dry atmosphere for additional protection of spice quality. Pre-cooling of the raw spice and the continuous low temperature maintenance within the grinder reduces the loss of volatile oils, color and moisture thereby retaining most of the flavor strength per unit mass of spice. The extremely low temperature in the grinder solidifies oils so that the spices become brittle, they crumble easily permitting grinding to a finer and more consistent size. Using liquid nitrogen or liquid air as the cryogen, all of thermo-sensitive spices can be ground below their brittle point temperature. The color and other properties of the products of cryogenic grinding will be much better than the ambient grinding in terms of their flavor and nutritional values. The high quality cryogenically ground spice powder would have domestic as well as international market.

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