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Experimental analysis of cutting characteristics of silicone rubber sheet with respect to indentation velocity of cutting blade

Masami Kojima

Nagaoka University of Technology, Japan

Silicone rubber is a kind of polymeric material that shows unique properties such as wide range of service temperature (155-589 K), high resistance to many chemicals (acid, alkali, solvents, oil, water). A subsequent cutting process is always required for converting the sheet into net or near net shape products. This work aims to reveal the deformation/cutting characteristics of a stacked silicone rubber worksheet subjected to a keen cemented carbide blade indentation. In this work, the relationship between indentation depth (displacement) of wedge blade to the silicone rubber sheet and its cutting force was experimentally investigated when varying the indentation velocity of blade, in order to reveal the effect of indentation velocity of blade on the cutting characteristics of silicone rubber sheet. The cemented carbide wedge blade of 100 μm thickness had the primary angle of 13.9 degree and the secondary angle of 4.2 degree. A silicone rubber worksheet of 1 mm thickness was stacked on an hard silicone rubber underlay of 1 mm thickness and the worksheet was cut off by the vertical indentation of wedge blade. The A-scale shore hardness of worksheet was chosen as 50 degree and that of underlay was 90 degree respectively. The indentation velocity of blade was chosen as $V=0.0167, 0.05$ and 0.20 mm/s. Some representative features such as the maximum peak cutting line force and its peak position (depth), the cutting inflection force and its inflection position were affected by the cutting velocity.

m_kojima@stn.nagaokaut.ac.jp