



ABSTRACT

Brazed single layer cBN wheel, characterized by high grit protrusion and tailored grit density on the working surface, has been reported to have potential for industrial application replacing other type of wheels including galvanically bonded one. The present study has, however, shown that such a brazed wheel is not totally free of weakness. It has been observed that a brazed wheel made with conventional alloy at moderate temperature was susceptible to several grit breakages at the bond level when chip load per grit was increased. A series of sequential investigations were carried out in an attempt to identify the major cause of such weakness and to find out remedial measures aiming at developing a truly advanced single layer brazed cBN wheel. In the present work, silver-copper based passive and active brazing alloys, uncoated and Ti-coated cBN grit along with uncoated and Ti-coated C20 steel substrate were characterized through different techniques. It was confirmed through single ring test that the wheel made with active braze alloy containing indium showed minimum number of premature grit breakage at the bond level. In fact, indium played dual beneficial role. Because of its presence as a constituent, the alloy not only exhibited a low liquidous point, which happened to be the lowest of the lot, but also the alloy could effectively wet the cBN surface at that low temperature. The observation on grit breakage was found to be consistent when a complete wheel was submitted for grinding. The present investigation has further shown that resistance to premature bond-level grit fracture could be remarkably improved when the working surface of the brazed wheel was treated with Ti-ion bombardment or coated with TiN by reactive bias sputtering seemingly by imparting compressive stress on the wheel surface during the surface treatment process. The said TiN coating, however, was not found to be that effective in reducing friction at the wheel-work interface.