

Neutron diffraction study of stress distribution in steel sheet around active NiTi inserts

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The quality and life time of stone processing tools is significantly affected by generation and accumulation of internal stresses during their operation. The rim of the cutting disc is exposed to a relatively high level of external working stresses of about 300 MPa and increased temperature (~70° C) which results in generating of non-homogeneous stress fields in the disc. To overcome this problem, the concept of active inserts made from shape memory alloys has been adopted. In the studied case, the small pre-strained elliptical NiTi elements were placed into elliptical holes cut in the cutting disc in locations of expected maximum stress concentration. To study the stress interaction of the NiTi inserts with cutting disc in detail, the method of neutron diffraction mapping of internal stresses was applied. The diffraction experiments were focused mainly to scanning of residual stresses around inserts and to describe the evolution of these stress-fields with increased temperature.