INFLUENCE OF MHP-TECHNOLOGY ON THE SURFACE NEAR MATERIAL STRUCTURE OF STAINLESS STEEL 1.4301

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Aim - provoking phase transformation (metastable austenitic $\gamma \rightarrow$ martensitic $\alpha'$) in 1.4301 at RT by inducing cold work through Machine Hammer Peening (MHP) using an electromagnetic actuator system with oscillating tool tip

**MHP parameter variation : 16 Samples**

<table>
<thead>
<tr>
<th>Increasing energy input:</th>
<th>Frequency (const.): $f=200$ Hz</th>
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<tbody>
<tr>
<td>Stepover distance $s = 0.1; 0.2$ mm</td>
<td>Stroke: $h = 0.3; 0.8$ mm</td>
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<tr>
<td>Distance of indent. $a = 0.1; 0.2$ mm</td>
<td>Tool Ø: $d = 3; 6$ mm</td>
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<tr>
<td>Feed rate: $v_f = 1.2; 2.4$ m/min</td>
<td>Number of machining $n = 1; 4$</td>
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**Methods** – deriving the effects of MHP process energy variation by:

- hardness depth profile measurements according to Vickers
- metallographic analysis by color etching
- microstructural-crystallographic (Electron BackScatter Diffraction - EBSD) investigations
RESULTS AND CONCLUSIONS

Influence of the ball diameters d on the surface hardness
Max. at No. 12 of 490 HV05 for d=3mm and No. 4 of 399 HV05 for d=6mm
Higher percentage overlap surface leads to additional increase in the surface hardness, as well as the achievable penetration depth

Clearly visible grain deformation and high dislocation density due to MHP processing
Multiple processing leads to higher deformations and more martensite being created

EBSD analysis discloses significantly more deformations at higher energy input
Colour coded phase map reveals large proportion of $\alpha'$ martensite (red) being created through MHP
Cold forming due to machine hammer peening can gain martensitic crystallographic structures with same chemical composition as base material

More information at the Poster 8079
The 6th Workshop MACHINE HAMMER PEENING will take place on 22nd November 2017 in Vienna

Lectures on new advancements in the technology, industrial applications as well as presentation of actual scientific research works on this surface modification technology

Exchange platform for discussions between developers, researchers and industrial applicants

For further information please visit: www.wmhp.tuwien.ac.at