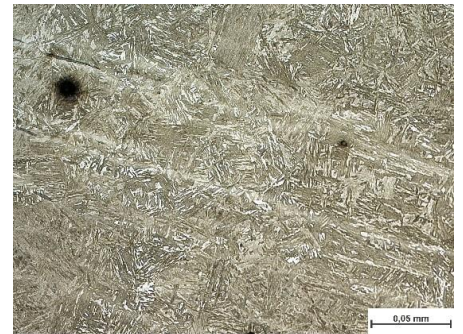


Announcement of a Master's Thesis, 07.05.2019

Evaluation of metallographic etching methods for high strength screw steels microstructure

Description

The microstructure of quenched & tempered (QT) and bainitic steels defines their mechanical properties but also their resistance against hydrogen embrittlement, which are the main issues. Though the determination of the present phases (tempered martensite, bainite and ferrite) in the Light Optical Microscope (LOM) is often not clear, as they appear similar in contrast and are very fine. The goal of this master thesis is to evaluate the microstructure of three different high strength steel types for screws; 42CrMo4, 40CrMoV4-6 and C82 using different etching methods, like Nital, picric acid, LePera, OP-S or others. The result from etching and LOM investigation should be; the determination of the phases (supported by microhardness measurements), the average grain size and the carbide distribution (in case they are not in nanometer scale).



Metallographic cross section etched with Nital (3% HNO₃ / ethanol) of 42CrMo4 steel rod (austenitisation 870°C-30min / isothermal holding at 360°C; Ms: 371°C) showing bainitic microstructure. H. Elsayed, TU Graz 2019

Working packages

- Literature study of etching methods for QT and bainitic screw steels (cold heading steel grades / Kaltstauchstähle) and decision for three promising methods for investigation
- Performing of metallographic cross sections for three alloys of different heat treatments and evaluation of microstructure issues (phases, grain size and carbides) as well as Vickers microhardness and macro-hardness HV5
- Documentation and establishing the thesis report

Prerequisites

Interest in metallography and etching (prior experience is beneficial), work independently

Organisation

Supervisor: Dr.techn. Rudolf Vallant rudolf.vallant@tugraz.at; Hamdi Ahmed Elsayed hamdi.ahmed@tugraz.at

Duration: as of now for min. 6 months

Location: Joining group, Steyrergasse 17, 8010 Graz

Reward: € 2.000 + € 500 performance bonus for an excellent success

Further informationen

For further information please contact the secretariat of the institute or the supervisor.

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