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AUTHOR: ④ Přenosil, Bohumil

TITLE: ⑥ Nitrocarburizing of low-alloyed steels with high carbon content

PERIODICAL: ⑤ Referativnyy zhurnal, Mashinostroyeniye, no. 20, 1962, 23 - 24, abstract 20B139 ("Material. sb. 1960, Čast 1", Státní výzkumný ústav materiálu a technol. Praha, 1960, 37 - 66, Czech; summaries in Russian and English)

TEXT: The author investigated the structure and properties of grade 14140, 15240 and 14240 steels (by ČSSR standards) which had been subjected to nitrocarburizing with the use of liquids composed of 60 - 90% Teral and 10 - 40% pyridine. Nitrocarburizing was carried out in Monocarb type furnaces at 820 - 860°C for 85 - 150 min. Six series of samples were processed. Four series were treated at 860°C and different Teral-pyridine proportions to obtain 0.2, 0.3, 0.4 and 0.6% nitrogen on the specimen surface. Two series of samples were subjected to nitrocarburizing at 840 and 820°C. The nitrogen content on their surface was 0.3%. The duration of the process was calculated in order to obtain a 0.4-mm

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layer. Carbon and nitrogen in the surface layer of the steels investigated were distributed as in non-alloyed low-carbon steel. It was established that rapid heating and short holding time in austenization prior to quenching, i.e. under heating conditions of passage furnaces, changes in the nitrogen and carbon distribution can be reduced to a minimum even without a shielding atmosphere. Temperature changes in the nitrocarburizing process within a 820 - 860°C range do not noticeably affect the nature of carbon and nitrogen distribution in the surface layer. Micro-X-ray and structural analyses show that the amount of residual austenite at 0.05 mm distance from the surface, varies within 42 - 79% after initial quenching and within 38 - 78% after repeated quenching. The highest amount of residual austenite is observed in 14240 steel in the third experimental series when the nitrocarburizing process is conducted with a liquid composed of 70% Teral and 30% pyridine (the nitrogen content in the surface layer is 0.4%). The effect of tempering temperature (170 - 260°C) upon the hardness of nitrocarburized layers was studied on specimens, 40.0 mm in diameter, at up to 200 kg loads and up to 400 rpm. It was found that the wear resistance of nitrocarburized specimens was much higher than that of carburized specimens. The wear resistance is particularly high in nitrocarburized specimens after repeated quenching. Ki-

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netics of austenite grain growth was determined and the mechanical properties and hardenability were investigated by studying the properties of the core (base metal) of nitrocarburized specimens. Thus, steel 15240 with vanadium admixture was found to be considerably less sensitive to grain growth than steels 14140 and 14240, and steel 14240 showed higher hardenability. To investigate mechanical properties, specimens, 6, 8, 10, 12 and 20 mm in diameter, were manufactured and subjected to heat treatment under the following conditions: 1) heating to 880°C, holding for 1 hour, oil cooling, tempering at 200°C for 1 hour; 2) heating to 860°C, air-cooling; 3) heating to 820°C for 30 min, oil cooling, tempering at 200°C for 1 hour. The ultimate strength did almost not change with a specimen diameter increasing to 12 mm, and decreased at a further increase of the diameter. This reduction was particularly marked in steel 15240, treated under conditions no. 2. Ductility is raised at an increased amount of residual austenite. Deformation of nitrocarburized gears was found to be below that of gas-carburized gears. There are 33 figures and 15 references.

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[Abstracter's note: Complete translation]

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