Editorial

Strong points. This is a notion from the ancient art of war. Reinforcing the territory of the own State was necessary to prevent its destruction. Many fortified strongholds and even strengthened temples were developed. The network of castles and fortresses was created on borderlands of many States. They were close enough so that they could support each other in case of the oppugnant army assault, and controlling the military situation in the radius of several or more than a dozen kilometres around and having the relevant stock of food, potable water and other necessary goods they could support the local population to let it survive for many weeks or even months, featuring the strong lodgements. The network of castles on the State border made dislocation of the enemy army difficult repressing their offensive up-country. Repeatedly it was the cause of failures of the aggressive plans of many military commanders and rulers of States, attesting in fact the power of the attacked party.

The castle in Kamieniec Podolski on the territory of the contemporary Ukraine is an example of the mediaeval fortification. The history of the district of Podolia on the Smotrycz river dates back dozens of thousands of years and from this time the following findings come: mammoth skeleton and flint wastes from the Mesolithic period. Many discoveries of the Trypilian material culture come from the period of about 4,000 BC, and from the first centuries AD the first proofs of the agricultural Tschernigow culture come, as well as coins and proofs of the trade and cultural contacts of the inhabitants of this district with Roman provinces. The urban structure appears here since Early Middle Ages. The town changed hands, successively from the Grand Duchy of Halych-Volhynia to Tartars, next to Grand Duchy of Lithuania, Moldova, to belong at last for more than two and half centuries to the Kingdom of Poland, and after signing the treaty in Buchach since 18 October 1672 it became a part of the Ottoman Empire, only to return to Poland on 12 September 1699 after signing the Peace of Karlowicki, and because of the partition of Poland in 1793 it passed under the rule of Russia, in November 1920 it was incorporated into the Union of Soviet Socialist Republics, finally – from the beginning of 1990s it belongs to Ukraine.

It is a beautiful monument of the fortification architecture. Kamieniec Podolski, treated for centuries in Europe as Antemurale Christianorum (Rampart of Christianity), was the biggest stronghold in the Eastern Europe. It used to be the Christianity redoubt located eastmost at the contact zone of the Latin and Byzantine cultures, and earlier of Christianity and Islam. Some of the war tactics and strategy ideas were assimilated in engineering. This suggests that one should fight also in this area. Perhaps it is not so literally; however, some phenomena and processes deciding forming the structure and properties of the engineering materials may lead us to believe that, especially as oftentimes we grapple with the opposing tendencies of improving the mechanical properties and eliminating consequences of strengthening and also we search compromise between strength and ductility.

Work hardening connected with the dislocations density increase results in improvement of the metal materials strength as in a certain broad range, used in engineering, change of the crystalline structure defects density affects strength properties. The Hall-Petch rule indicates that refinement of the polycrystalline materials structure, and therefore density growth of the wide-angle boundaries, causes strengthening of these materials. One of the ways to realise this approach is the martensitic transformation, in which the series if successive glides and twinnings results in the significant strength improvement of metal alloys by their significant structure refinement. During hot-working the boundaries of the dynamically recrystallising grains are stopped by the relatively hard, undissolved dispersive phases, e.g., carbides in steels, which results in blocking the grains growth and ensuring the fine-grained structure. It is very similar to blockade of dislocation of troops by fortresses defending themselves strongly as it was the case for many years in Kamieniec Podolski. A very strong mechanism is the Orowan mechanism of blocking the dislocation glide by the relatively hard and dispersive precipitations or phases particles, deciding in fact the precipitation hardening and dispersive strengthening respectively. The reverse stress in such cases can be so big that the Frank-Read sources generating dislocations are blocked which results in the significant strength improvement of the material strengthened in this way. This method is used, among others, for the dispersive strengthening of the age hardened metals alloys, but also for strengthening of materials sintered with the powder metallurgy methods and of the composite materials "in situ". The analogies mentioned do not exhaust of course all possibilities and mechanisms of strengthening the engineering materials.

Knowledge about the strengthening processes of engineering materials (or when strengthening results have to be removed) belongs to the most important areas of the contemporary materials engineering. It is so important, as its paradigm encompasses material selection to ensure the service properties of the designed products by providing the possibly most advantageous physical and chemical properties of the material by forming its structure in the materials processing technologies, apart from shaping the product form only with the other technologies. Therefore, all projects are interesting, also from the Journal of Achievements of Materials and Manufacturing Engineering Editing Board's and P.T. Authors' point of view, which pertain to investigation of relationships between the chemical composition and the fabrication and processing methods of various engineering materials, and their structure and properties, where the strengthening play undoubtedly the key role. We still look forward to such works being sure that their reading is advantageous for P.T. Readers of the Journal, because all we do when we publish its consecutive Issues is done with our P.T. Readers in mind. Therefore, we invite you to further cooperation.

Gliwice, in August 2008

Prof. Leszek A. Dobrzański M. Dr hc
Editor-in-Chief of the JAMME
President of the WAMME
President of the ACMS&SE