

Super Deep Penetration

a.k.a ‘Usherenko effect’

Super Deep Penetration – a unique methodology and a process of creation of nano reinforcing strings in metals, alloys, ceramics and polymers.

Presented by:

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Super deep penetration effect

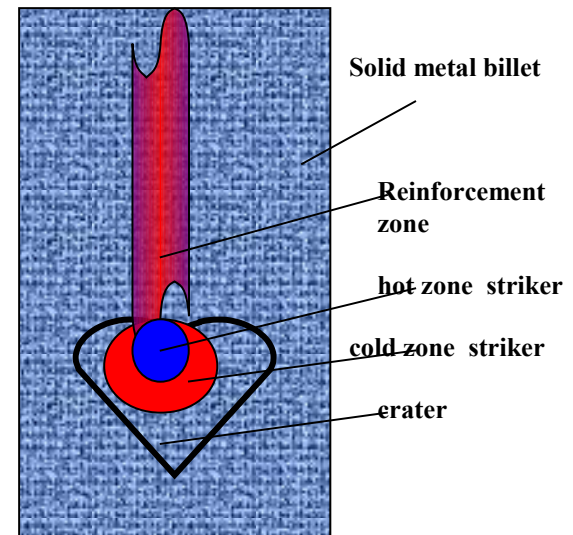
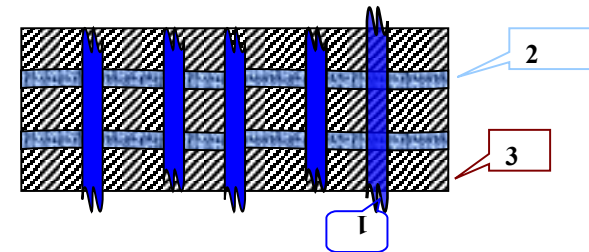
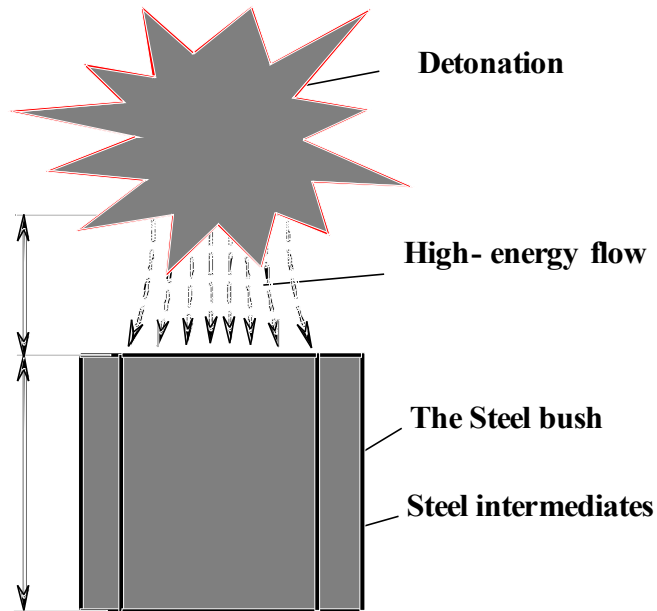
- **Super deep penetration /SDP/- changes structure, physical, electric, etc. properties in a solid body**
- **SDP alters the properties of the penetrated (base) material in a specific pre-determined volume and direction.**
- **SDP leads to higher strength, better conductivity, improved behavior: possibilities of making new advanced classes of materials for various industrial uses**
- **SDP allows creation of the nano-composite materials that otherwise cannot be made by other known methods.**

Illustration of Super Deep Penetration – “Usherenko effect”

Creation of the nano composite material under SDP process.

1 - longitudinal fibers. 2 - cross-section fibers. 3 - the basic material (steel).

The scheme of the accelerator of a powder flow.



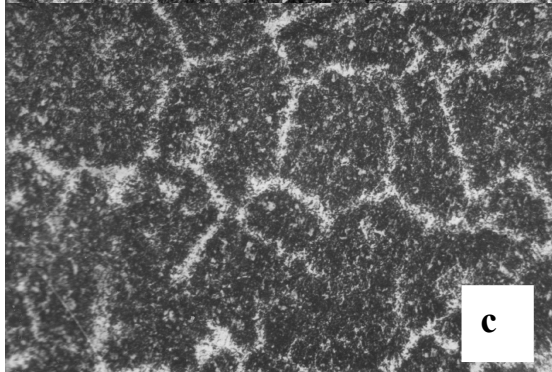
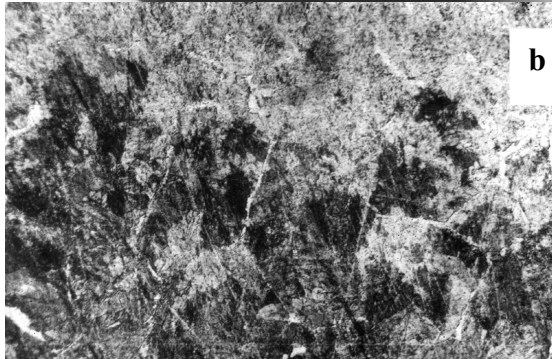
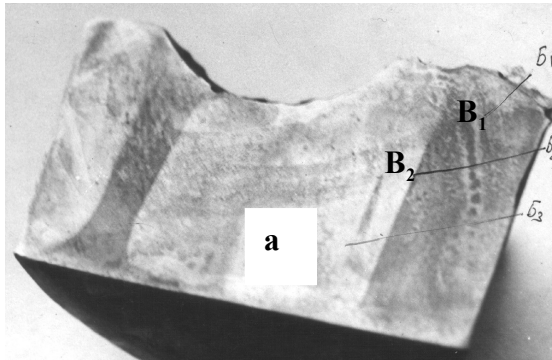
Nano-effect of Super deep penetration in applications to

Nano reinforcement of the

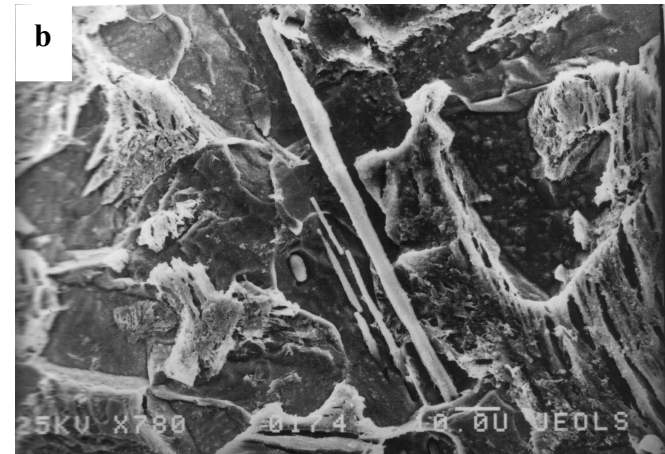
- working parts of the steel cutting tools- pilot production ready**
- aluminum – R&D/lab samples**
- fluoride based polymers and composites – early R&D**
- ceramics – R&D**

Nano Structural system of steels after Super Deep Penetration

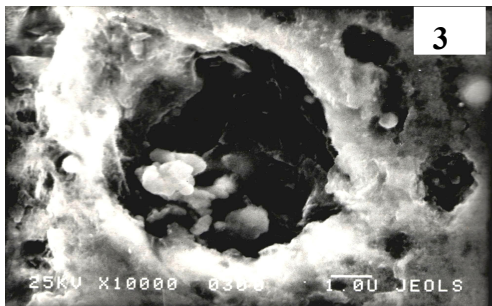
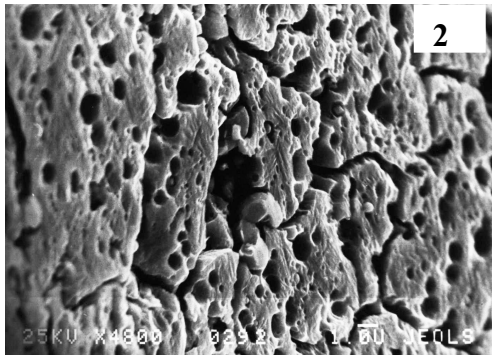
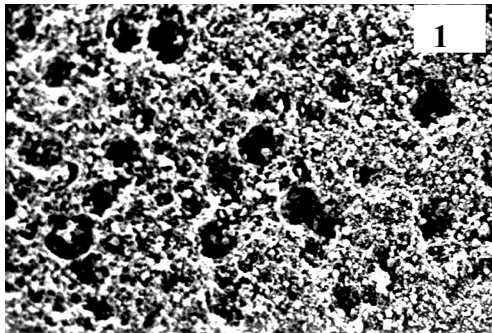
Fiber structure in steel after processing in condition of SDP: a - fiber from Al=13,99 %; Mn=39,17 %; Pb = 17,68 %, Fe = the rest; b - fiber on the basis of Al_2O_3 .



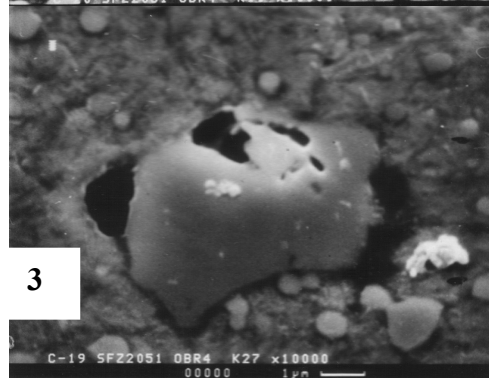
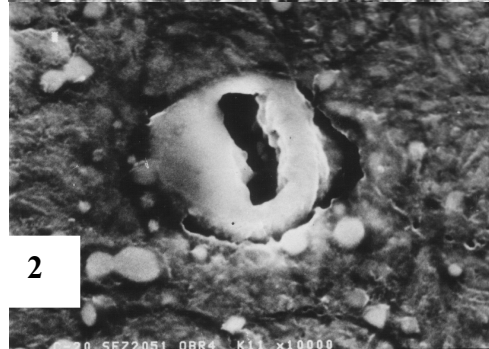
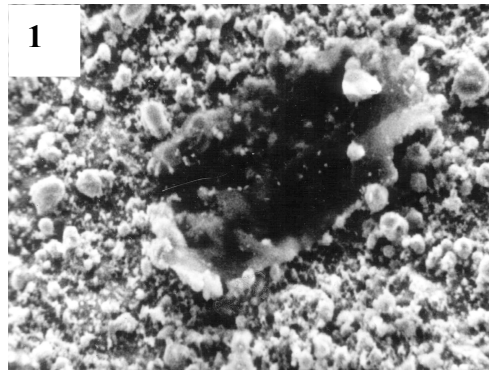
Distribution of high pressures of flow at impact: and a - $\times 1$; b - boundary of section of areas of high and low pressure, $\times 200$; c - subdivision of elements of structure of area of the high pressure of steel barrier at heat (1000°C, 1 hour), $\times 200$.



The activated zones in “high-speed” steel



1 TiB_2 , $\times 700$. 2 - SiC ,
 $\times 2000$. 3 - TiCN , $\times 8000$.

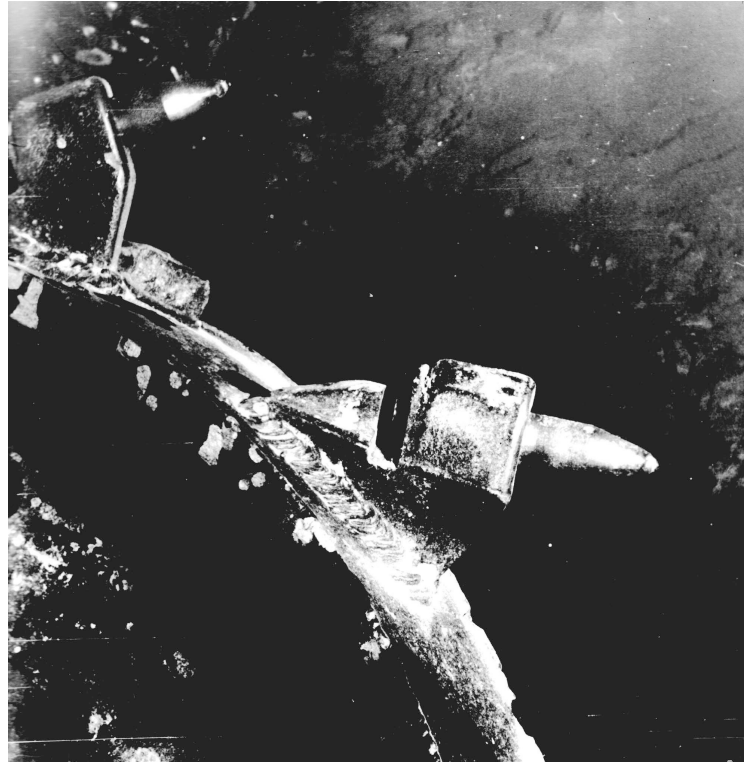
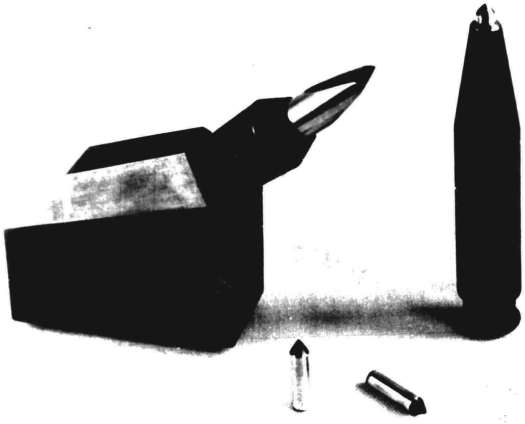


1 - $\times 2200$; 2,3 - 10000

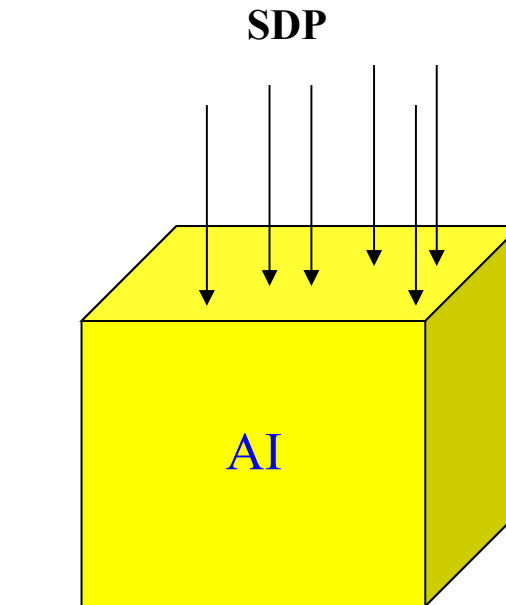
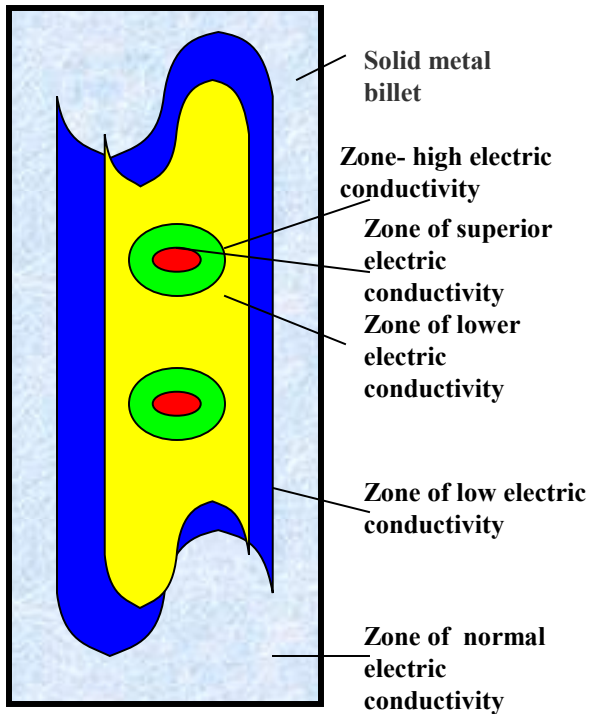
Improved wear resistant zones

180%

The self-sharpening mining tools and metal billets of the composite tool material made by SDP method.

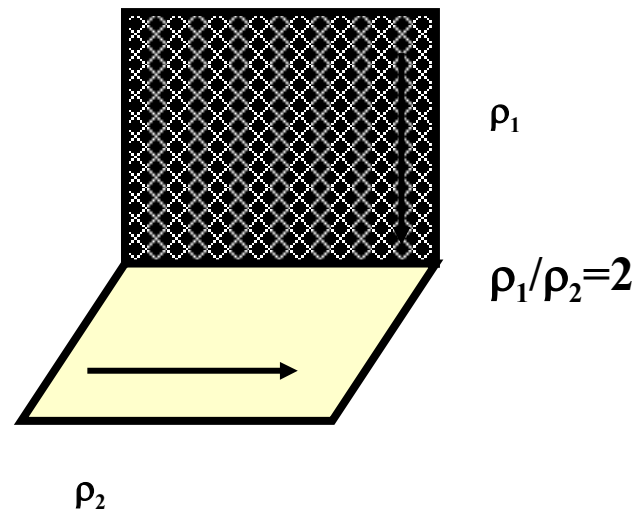


Aluminium composite making by SDP



Processed metal

The direction dependent physical properties – creation of the composite out of Al



The lowered electric resistance in Al composite created by SDP

Aluminum nano-composite under SDP benefits

Possibility of making of a new class of the materials for electrical and other uses with

- Very significant price reduction for making nano-composite
- Elimination of the sintering stage – preservation of the nano-structure/properties
- Ease of the subsequent mechanical processing
- Elimination of “stinging corrosion” – increased longevity/reliability/safety of the electrical parts
- Possibility of making filters with micro and nano sieves for filtration of bacteria
- Possibility of making new nano composites for electronics use