Non-sticking antibacterial protection ofbiomedical devices

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DLC is known to be non-toxic and safe for biological applications [1]. With positive reviews from the FDA, it has become the most desirable material for coating biomedical devices and tools like stents, heart valves, surgical instruments, etc [2]. Another important characteristic relevant to bomedical applications is its non-sticking effect which was found to be better for r H-free DLC compared to its hydrogenated counterpart [3].Apart from its high potential to preventadherence of live tissue cells on surgical instruments during surgery, microbial adhesion is also lowered. For further improving the outcome of surgery, antimicrobial metals like Ag, Cu, Au, etc can be incorporated into the DLC using plasma-based deposition systems.

We present here the bio-performance of H-free DLC-Ag-Cu complex coatings obtained by an original plasma-based deposition technology developed in our group. The main assets of the coating technology are: ability to obtain homogeneous fine mixture of compoundsat a nanometric level, high adherence on the substrate (including stainless steel), ability to coat temperature sensitive materials like plastics and textiles, scalability for larger production.

Our films were found to be hard, with about 42 GPa hardness and very smooth (about 2 nm roughness). The anti-bacterial efficacy of these coatings against various bacteria as well as their non-sticking effect on living cells was assessed and compared to bare stainless steel.A time dependence observation of bacterial count on our complex surfaces has shown total innactivation of all bacteria studied within five minutes after surface contact.Such coatings will have a major impact in preventing stickingof living cells and bacteria on medical instruments.

Figure 1:*The plasma source and thin films deposited on stainless steel*

Acknowledgments
The authors acknowledge the Romanian Ministery of Research for funding the current work under project PNII-3-0953/2011.

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