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BIBILIOGRAPHY:

- [1] N. J. M. Carvalho and J. T. M. DeHosson, "Microstructure investigation of magnetron sputtered WC/C coatings deposited on steel substrates," *Thin Solid Films*, vol. 388, no. 1–2, pp. 150–159, 2001.
- [2] R. Ladurner and W. Steurer, "Technik der multiorganentnahme," *Viszeralchirurgie*, vol. 39, no. 6, pp. 439–442, 2004.
- [3] E. Eser, R. E. Ogilvie, and K. A. Taylor, "Friction and wear results from WC+Co coatings by –dc- biased rf sputtering in a helium atmosphere," *J. Vac. Sci. Technol.*, vol. 15, no. 2, pp. 401–405, 1978.
- [4] D. G. B. A. R. A. HOLZL, "MICROSTRUCTURAL EVALUATION OF CM 500L, A NEW W-C ALLOY COATING DEPOSITED BY THE CONTROLLED NUCLEATION THERMOCHEMICAL DEPOSITION PROCESS*," *Thin Solid Films*, vol. 95, pp. 105–112, 1982.
- [5] K. A. Taylor, "Thin Solid Films, 40 (1977) 189-200 ©," vol. 40, pp. 189–200, 1977.
- [6] P. K. Srivastava, T. V. Rao, V. D. Vankar, and K. L. Chopra, "Synthesis of tungsten carbide films by rf magnetron sputtering," *J. Vac. Sci. Technol. A Vacuum, Surfaces, Film.*, vol. 2, no. 3, pp. 1261–1265, 1984.
- [7] K. Machida, M. Enyo, and I. Toyoshima, "Preparation of W-C thin films by reactive R.F. sputtering and Auger electron spectroscopy surface characterization," *Thin Solid Films*, vol. 161, no. C, pp. 91–95, 1988.
- [8] P. Gouy-Pailler, "Characterization of tungsten-carbon layers deposited on stainless steel by reactive magnetron sputtering," *J. Mater. Res.*, vol. 7, no. 8, pp. 2070–2079, 1992.
- [9] K. Fuchs and P. R. Dhammer, "E. bertel and f. p. netzer," pp. 383–395, 1987.
- [10] H. Tsai and D. B. Bogy, "Characterization of diamondlike carbon films and their application as overcoats on thin film media for magnetic recording Critical Review Characterization of diamondlike carbon films and their application as overcoats on thinfilm media for magnetic recor," vol. 3287, no. 1987, 2014.

- [11] A. Raveh, L. Martinu, H. M. Hawthorne, and M. R. Wertheimer, "Mechanical and tribological properties of dual-frequency plasma-deposited diamond-like carbon," *Surf. Coatings Technol.*, vol. 58, no. 1, pp. 45–55, Jun. 1993.
- [12] A. A. Minevich, "Wear of cemented carbide cutting inserts with multilayer Ti-based PVD coatings," *Surf. Coatings Technol.*, vol. 53, no. 2, pp. 161–170, Sep. 1992.
- [13] O. Wänstrand, M. Larsson, and P. Hedenqvist, "Mechanical and tribological evaluation of PVD WC/C coatings," *Surf. Coatings Technol.*, vol. 111, no. 2–3, pp. 247–254, Jan. 1999.
- [14] G. Farges, J. P. Bosch, and E. Bergmann, "Friction and adhesive wear behaviour of W-C coatings against steel and titanium nitride," *Wear*, vol. 135, no. 1, pp. 1–14, Dec. 1989.
- [15] G. W. (Gwidon W. . Stachowiak, Frontiers in tribology: proceedings of the 6th International Tribology Conference AUSTRIB '02. Printed by Fineline, 2002.
- [16] D. Nilsson, F. Svahn, U. Wiklund, and S. Hogmark, "Low-friction carbon-rich carbide coatings deposited by co-sputtering," *Wear*, vol. 254, no. 11, pp. 1084–1091, 2003.
- [17] F. Application and P. Data, "United States Patent (19)," no. 19, 1987.
- [18] N. J. Archer and K. K. Yee, "Chemical vapour deposited tungsten carbide wear-resistant coatings formed at low temperatures," *Wear*, vol. 48, no. 2, pp. 237–250, Jun. 1978.
- [19] "Catalog Record: Proceedings of the Conference on Chemical... | Hathi Trust Digital Library."
- [20] "Process for the deposition of refractory metal and metalloid carbides on a base material," Aug. 1968.
- [21] W. A. Bryant and G. H. Meier, "Factors affecting the adherence of chemically vapor-deposited coatings," *J. Vac. Sci. Technol.*, vol. 11, no. 4, pp. 719–724, Jul. 1974.
- [22] D. Garg, P. N. Dyer, D. B. Dimos, S. Sunder, H. E. Hintermann, and M. Maillat, "Low-Temperature Chemical Vapor Deposition Tungsten Carbide Coatings for Wear/Erosion Resistance," *J. Am. Ceram. Soc.*, vol. 75, no. 4, pp. 1008–1011, Apr. 1992.
- [23] S. H. Leigh and C. C. Berndt, "A test for coating adhesion on flat substrates-a technical note," *J. Therm. Spray Technol.*, vol. 3, no. 2, pp. 184–190, 1994.

- [24] "Hard metal watch case with a resistant coating," May 1985.
- [25] K. Y. Ahn, M. Wittmer, and C. Y. Ting, "Investigation of Tin films reactively sputtered using a sputter gun," *Thin Solid Films*, vol. 107, no. 1, pp. 45–54, Sep. 1983.
- [26] O. Knotek, R. Elsing, M. Atzor, and H.-G. Prengel, "The influence of the composition and coating parameters of PVD Ti-Al-V(C.N) films on abrasive and adhesive wear of coated cemented carbides," *Wear*, vol. 133, no. 1, pp. 189–198, Sep. 1989.

References

- Aggeliki.K. (n.d.). *understanding the concepts of magnetron sputtering*. Retrieved from bright hub engineering: https://www.brighthubengineering.com/manufacturing-technology/87512-theory-and-operation-of-magnetron-sputter-deposition-coating-process/
- aldrich, s. (n.d.). *sputterin targets*. Retrieved from Merck: https://www.sigmaaldrich.com/materials-science/material-science-products.html?TablePage=108832720
- C.HEYMANN, R. L. (1973). BRITISH Patent No. 1,326,769.
- Goretzki, K. K. (1969). the reflectance properties of cvd coatings. z.metallkd.., 587.
- K.K.Yee. (1978). Protective Coatings for metals by chemical vapor deposition. *international metallurgical review*, 1942.
- N.K.Joshi. (2012, august). correlation of plasma properties and magnetron properties of TiN films.

 Retrieved from research gate: https://www.researchgate.net/figure/Schematic-Diagram-of-DC-magnetron-sputtering-system-with-Langmuir-probe_fig5_258642791
- NILLSON, D. (2002). Effects of substrate bias polarity on tribological a-C:Ta coatings. *Proceedings of the 6th International Tribology Conference, AUSTRIB '02, 2002*, 95-101.
- Stahli, G. &. (1976). EVALUATING WEAR PERFORMANCE UNDER ABRASIVE AND ADHESIVE SLIDING BY MEANS OF MODEL TESTS. *Sulzer Technical Review*, 33-40.