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Suppression of 1/f Flux Noise in Superconducting Quantum Circuits PRADEEP KUMAR, University of Wisconsin, Madison, JOHN FREELAND, Advanced Photon Source, Argonne National Lab, Argonne, IL, CLARE YU, RUQIAN WU, Department of Physics and Astronomy, University of California, Irvine, CA, ZHE WANG, State Key Laboratory of Surface Physics and Department of Physics, Fudan University, Shanghai, China, HUI WANG[1], CHUNTAI SHI[2], Department of Physics and Astronomy, University of California, Irvine, CA, DAVID PAPPAS, National Institute of Standards and Technology, Boulder, CO, ROBERT MCDERMOTT, University of Wisconsin, Madison — Low frequency 1/f magnetic flux noise is a dominant contributor to dephasing in superconducting quantum circuits. It is believed that the noise is due to a high density of unpaired magnetic defect states at the surface of the superconducting thin films. We have performed X-ray absorption spectroscopy (XAS) and X-ray magnetic circular dichroism (XMCD) experiments that point to adsorbed molecular oxygen as the dominant source of magnetism in these films. By improving the vacuum environment of our superconducting devices, we have achieved a significant reduction in surface magnetic susceptibility and 1/f flux noise power spectral density. These results open the door to realization of superconducting qubits with improved dephasing times.

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