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Nitric Oxide Reactor for Conjugating Nitric Oxide to Polymers

The surfaces of blood contacting medical devices promote blood clot formation which can cause life threatening complications including deep vein thrombosis and embolism in the lungs/heart/brain. As current anti-fouling surface modifications alone haven't solved this problem, alternate approaches including optimized anti-platelet nitric oxide (NO) release for long term (weeks to months) clot control are needed. The objectives of this study were to build a NO reactor, charge medical grade polydimethylsiloxane (PDMS) polymer with NO using the reactor, and evaluate NO release from PDMS with a NO analyzer. A nitric oxide reactor was built using stainless steel pipes, connectors, values, pressure gauges and a reaction vessel. Once the reactor was built, a system leak test was conducted by pressurization with argon at reactor operating pressures. A NO scrubber was added to trap all exhaust NO from the reactor. PDMS polymers were then impregnated with additives and charged under high pressure NO environment. Physiological levels of NO release was achieved for 15 days. Additional studies are needed to examine pH changes and the effects of pH on the NO release so that the polymer composition can be appropriately optimized to achieved longer-term release. Ultimately, the enhanced material can be applied to blood-contacting medical devices to locally limit clot formation without the use of systemic anticoagulation.