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Circularise, a blockchain-based supply-chain traceability and digital-product-passport platform for materials vs credentialed material surfaces: attestations bound to the physical material

Circularise is a blockchain-based supply-chain traceability and digital-product-passport platform that lets materials and product manufacturers record provenance, mass-balance, and sustainability claims and share them selectively across a supply chain. The hard problem in the materials world is not only recording that a claim exists but binding a policy-evaluable, multi-authority attestation to the physical material itself so downstream systems can admit or deny operations against published rules. This article contrasts that record-and-passport approach with the credentialed-surface architecture built on Credentialed Surfaces, disclosed in U.S. Provisional Application No. 64/050,895.

What Circularise, a blockchain-based supply-chain traceability and digital-product-passport platform for materials Does

Circularise is a supply-chain transparency platform aimed at materials and manufacturing. It gives producers, converters, and brand owners a way to record where a material came from, how it moved through a chain of custody, and what sustainability

or compliance claims attach to it, then to share selected parts of that record with chosen counterparties. Two elements are widely associated with its approach. The first is a digital product passport, a structured record that travels alongside a product or material and carries provenance and characteristic data intended to satisfy emerging regulatory and customer disclosure requirements. The second is a selective-disclosure mechanism that lets a participant prove a specific claim to a specific counterparty without exposing the full underlying dataset or the identities of upstream suppliers, which is a genuine and useful answer to the confidentiality problem that keeps many supply-chain actors from sharing data at all.

These are real strengths. Recording provenance across independent organizations, supporting mass-balance and chain-of-custody accounting, and enabling privacy-preserving proofs are substantial capabilities, and they address a real market need as material-disclosure regulation expands. The platform is a shipping product used by real customers. Nothing here is a criticism of that work. The purpose of this article is narrower: to identify one architectural axis and describe how the disclosed approach is structured differently along that single axis.

The Architectural Axis

The axis is where the attestation lives and how it is evaluated. A traceability and digital-product-passport platform is oriented around a record that describes a material: a passport document, a set of claims, a chain-of-custody ledger, and controlled sharing of that information among participants. The record is the primary artifact, and the physical material is the thing the record refers to.

The disclosed architecture inverts that relationship along one dimension. Its primary artifact is a credentialed admissibility profile bound by cryptographic signature to the identity of a specific physical material, element, or assembly, and structured not merely to describe the material but to be evaluated as policy at the moment an operation is attempted. The specification defines an admissibility profile as a structured data object

that declares one or more property surfaces, each surface declaring property-specific parameters and admission conditions, and defines a credentialed admissibility profile as such a profile bound to the material's identity and traveling with it through manufacturing, installation, operation, and end-of-life processing. This is a difference in what the artifact is for, not a defect in the passport approach: one is a record shared among participants, the other is a policy surface admitted against at evaluation time.

How the Disclosed Approach Differs

Several structural features in the specification make the difference concrete on this axis.

Property surfaces, not a single record. Rather than one passport, the disclosed profile carries a plurality of independently credentialed property surfaces, each covering one declared property category, for example structural, thermal, energy storage, fire performance, carbon sequestration, and others. Each surface declares its own parameters and admission conditions and is signed by an authority competent for that scope. A structural engineering authority signs the structural surface; a fire-marshal authority signs the fire-performance surface; an environmental-credit authority signs the carbon-sequestration surface. This is the multi-authority signature block described in the specification: the profile is not attested by one issuer but composed from separately scoped attestations that admit independently.

Composition rules as signed, versioned artifacts. The property surfaces do not merely coexist; they compose through a composition-rule architecture. Each composition rule is itself a credentialed and signed data artifact declaring a scope, a composition logic specifying how surfaces interact, a version vector for deterministic conflict resolution, a conflict-resolution policy, and an authority signature, held in a composition-rule registry consumed at admissibility-evaluation time. A representative rule reduces

storage admissibility to zero when the fire-performance surface declares a fire event. This makes cross-property policy an evaluable, versioned, signed object rather than an out-of-band business process.

Lineage as a governed chain, with versioned profiles. The specification records each lifecycle transition, pre-installation credentialing, in-service operation, end-of-storage-life, decommissioning, recycling-grade re-credentialing, and re-installation, as a credentialed event signed by an appropriate authority and recorded in a lineage chain. Profile versioning is maintained through monotonically increasing version vectors with declared conflict-resolution policies, and authority revocation propagates through the lineage chain and is honored prospectively at evaluation time. This describes a governed lineage with explicit versioning and prospective revocation semantics, distinct from an append-only provenance log.

Attestations that migrate with the physical material. Because the profile is bound to the material's identity, the specification describes continuous re-credentialing across operational material flows during service life and a migrating carbon attestation in which biogenic carbon-credit attestations move with the substrate across material flows and structural lifetimes as credentialed transactions signed by an environmental-credit authority. The attestation is not only a record of the material; it is bound to and travels with the specific physical mass.

Where They Fit Together

These approaches are more complementary than competing, and honesty requires saying so. A traceability and digital-product-passport platform answers questions the disclosed architecture does not: how a material moved across many independent organizations, how mass-balance accounting reconciles across a chain, and how a claim is disclosed to a counterparty without revealing confidential upstream detail. That cross-organization ledger and selective-disclosure capability is real work that a material-bound profile does not by itself perform.

A plausible composition is straightforward. The disclosed credentialed profile could serve as the material-bound, policy-evaluable attestation that authorities sign and that admissibility evaluation consults at the point of an operation, while a passport-and-traceability platform serves as the cross-organization record and disclosure layer that carries and shares those attestations along the supply chain. One is the local policy surface bound to the physical material; the other is the shared ledger and disclosure fabric among participants. They address different halves of the problem, and treating them as substitutes would misread both.

Boundary Conditions

The comparison must be honest about asymmetry. Circularise is a deployed, in-market platform with real customers. The disclosed subject matter is a provisional patent disclosure of an architecture. It is not built, validated, benchmarked, or independently verified, and this article asserts no such thing. Any advantage described here is an architectural property of the disclosed design as written, not a demonstrated result.

The materials science underlying the disclosed substrate is prior art. Cementitious composites, carbonaceous additives, electric-double-layer storage, and non-corroding reinforcement are pre-existing. The disclosure claims no newly discovered chemistry and no novel basic science, and the specification itself frames the underlying material behaviors as known and its capacity figures as declared ranges rather than measured outcomes. The novelty at issue is the credentialing and admissibility-profile architecture applied to physical materials and the multi-function-surface category, not the materials themselves. Numbers such as storage capacity, cycle life, and efficiency in the specification are declared design ranges in a disclosure, not benchmarks, and should not be read as demonstrated performance.

Finally, the axis addressed here is narrow. It concerns where an attestation lives and how it is evaluated as policy. It does not extend to the cross-organization traceability, mass-balance reconciliation, or regulatory-passport formatting where a dedicated

platform is purpose-built, and no claim of superiority on those dimensions is made or implied.

Disclosure Scope

The architecture described on the disclosed side of this comparison, credentialed admissibility profiles bound to physical materials, multi-authority signature blocks, signed and versioned composition rules, a governed lineage chain, and migrating attestations, is disclosed in U.S. Provisional Application No. 64/050,895. All statements about Circularise and about the broader traceability and digital-product-passport market are external context drawn from generally available descriptions of that category and are not representations of the filing, not part of its disclosure, and not claims made in it. Nothing here asserts or implies any defect, deficiency, or wrongdoing in Circularise or any other named product; the platform is treated as a capable, in-market offering, and the comparison is confined to a single architectural axis of where an attestation resides and how it is evaluated. Descriptions of the disclosed subject matter reflect the provisional specification as written and are not representations that any system has been built, tested, or validated.

Credentialed Surfaces (/credentialed-materials) All 40 steps → (/inventive-steps)

Building surfaces as credentialed agents that participate in the structure's networking and electrical systems.

Provisional application

PRIMARY TECHNICAL DISCLOSURE

– Credentialed Building Materials: Cryptographic Admissibility for Structural Surfaces (/articles/credentialed-building-materials-cryptographic-admissibility-for-structural-surfaces)

SECONDARY TECHNICAL

- Carbon-Sequestration Admissibility Surface (/articles/credentialed-materials/carbon-sequestration-property-surface)
- Composition Rules Governing Surface Interactions (/articles/credentialed-materials/composition-rules)
- Decommissioning And Re-Credentialing Attestation (/articles/credentialed-materials/decommissioning-and-recredentialing)
- Electrical-Distribution Admissibility Surface (/articles/credentialed-materials/distribution-property-surface)
- End-Of-Storage-Life Attestation (/articles/credentialed-materials/end-of-storage-life-attestation)
- Energy-Storage Admissibility Surface (/articles/credentialed-materials/energy-storage-property-surface)
- Lineage Chain Across Material Lifecycle (/articles/credentialed-materials/lineage-chain-across-lifecycle)
- Authority Signatures Block Binding Property Surfaces To Material Identity (/articles/credentialed-materials/master-credential-binding)
- Multi-Authority Signature Block (/articles/credentialed-materials/multi-authority-signature-block)
- Data Network Admissibility Surface (/articles/credentialed-materials/network-property-surface)
- Profile Versioning Continuity (/articles/credentialed-materials/profile-versioning-continuity)
- Structural Admissibility Surface (/articles/credentialed-materials/structural-property-surface)
- Thermal-Property Admissibility Surface (/articles/credentialed-materials/thermal-property-surface)
- Versioned Admissibility Profiles With Lineage Chain (/articles/credentialed-materials/versioned-profiles-with-lineage)
- Water-Coupled Admissibility Surface (/articles/credentialed-materials/water-coupled-property-surface)

APPLICATIONS · GENERAL

- Credentialed Structural Materials for Construction and Civil Infrastructure: Carrying Strength, Mix, and Provenance as Multi-Authority Attestations (/articles/credentialed-materials/construction-and-infrastructure)
- Carbon-Credit-Bearing Building Materials: Sequestration Attestations That Survive Incorporation, Transfer, and Decommissioning (/articles/credentialed-materials/carbon-credit-materials)
- Building-Product Compliance and Code Approval: Property-Surface Profiles as Machine-Evaluable Admissibility Evidence (/articles/credentialed-materials/building-product-compliance)

- Credentialed Building Materials for Real Estate Valuation, Insurance, and Disclosure: A Property History That Binds to the Asset (/articles/credentialed-materials/real-estate-and-asset-lifecycle)
- Recredentialing Recovered Materials: Verifiable Lineage for Reuse and Decommissioning in the Circular Economy (/articles/credentialed-materials/circular-economy-and-decommissioning)
- Energy and Grid-Coupled Surfaces: Crediting Stationary Storage in Structural Mass Without Trusting the Cell (/articles/credentialed-materials/energy-and-grid-surfaces)
- Credentialed Surfaces for Water and Environmental Infrastructure: Signed Performance and Compliance Attestations on Water-Coupled Concrete (/articles/credentialed-materials/water-and-environmental-infrastructure)

APPLICATIONS · SPECIFIC

- **Circularise, a blockchain-based supply-chain traceability and digital-product-passport platform for materials vs credentialed material surfaces: attestations bound to the physical material (/articles/credentialed-materials/circularise)**
- EC3 (Embodied Carbon in Construction Calculator) by Building Transparency vs a credentialed carbon-sequestration surface bound to the material (/articles/credentialed-materials/ec3-building-transparency)
- CarbonCure Technologies, which injects and mineralizes CO2 into concrete during mixing vs a credentialed carbon-sequestration attestation architecture (/articles/credentialed-materials/carboncure)
- Sublime Systems, maker of low-carbon cement via an electrochemical (ambient) process vs a credentialed carbon-sequestration surface bound to the material (/articles/credentialed-materials/sublime-systems)
- Brimstone carbon-negative portland cement vs credentialed material attestations: process decarbonization or per-element carbon accounting? (/articles/credentialed-materials/brimstone)
- The EU Digital Product Passport (DPP) under the Ecodesign for Sustainable Products Regulation (ESPR) vs credentialed surfaces: a data-carrier standard next to a material-bound attestation architecture (/articles/credentialed-materials/eu-digital-product-passport)
- One Click LCA, a life-cycle-assessment and EPD software platform for construction vs a credentialed carbon-sequestration property surface bound to the material (/articles/credentialed-materials/one-click-lca)
- Concrete.ai vs credentialed carbon-sequestration surfaces on structural materials (/articles/credentialed-materials/concrete-ai)

Credentialed Surfaces overview → (/credentialed-materials)